THE HEATING AND VENTILATING MAGAZINE

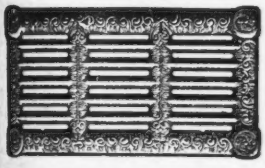
VOL. VI., NO. 9 NEW YORK, SEPTEMBER, 1909 $1.00 a year, 10 cents a copy

GURNEY HEATERS
FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER
THEY GIVE ENTIRE SATISFACTION SEND FOR CATALOGUE.
GURNEY HEATER MANUFACTURING CO.
NEW YORK OFFICE 12 E 42ND ST. 188-200 FRANKLIN ST. BOSTON.

KIELEY
Kieley & Mueller
34 West 13th Street
New York City, N. Y.

Reducing Valves and Steam Traps for all services; Damper Regulators, Back Pressure and Relief Valves. Grease Extractors and Steam Separators. Pump Governors. Pump Regulators. Float Valves, Water Arches, Hot Water Temperature Controllers, Water Feeders, etc.

Steam Specialties



FOWLER & WOLFE MANUFACTURING CO.
ORIGINATORS OF WALL RADIATION
Bourse Building, Philadelphia, Pa.
WE GUARANTEE OUR WALL RADIATION:
To contain the rated surfaces.
To have been tested at 100 lbs. pressure before shipment.
To provide for perfect circulation when installed in either vertical or horizontal form.
We challenge any other manufacturers of wall radiation to equal the above guarantee.

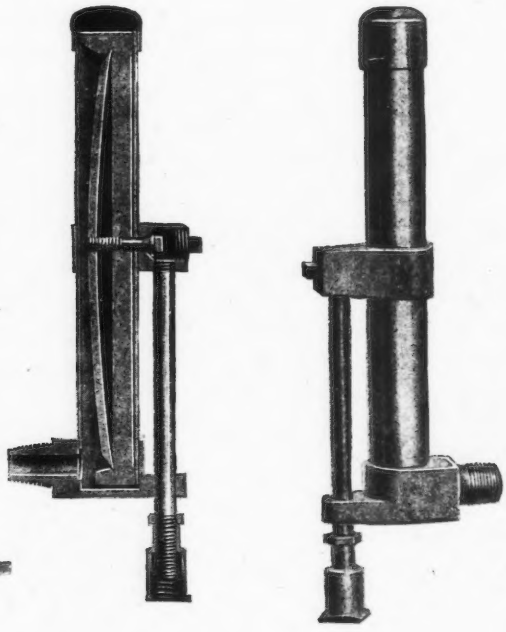
THE "GLOBE" VENTILATOR
COPPER AND GALVANIZED IRON
SIMPLE, SYMMETRICAL, STORM PROOF, SUCCESSFUL
Model and Blue Print on Application
GLOBE VENTILATOR CO. TROY, N. Y.

THOUSANDS IN SERVICE
Class Q
Foster Pressure Regulators
FOR
General Steam Heating
Foster Engineering Co. Newark, N. J.

THE COVERING and SUPPLY CO.
Manufacturers, Dealers and Contractors in
ASBESTOS MATERIALS
STEAM PIPE and BOILER COVERINGS of Every Description
OFFICE and WAREROOMS 232 West St., New York

Entered as second-class matter at the Post-Office in New York, N. Y. Copyright, 1909, by A. S. Armagnac

CROSBY Spring Seat Globe and Angle **VALVES** All parts Interchangeable. All Parts Removable Tested for Highest Pressures **LEAK-PROOF**
CROSBY STEAM GAGE & VALVE CO.
Boston
New York
Chicago



Breckenridge Automatic Air Valves

For direct and indirect radiation—ornamental as well as perfect in construction—neat and durable, made of selected material—none better. A valve of known and proven worth. Send for booklet illustrating the several styles of valves of our manufacture.

THE H. B. SMITH CO.

65 Main Street, Westfield, Mass.

SALESROOMS:
39 E. Houston Street, New York
728 Arch Street, Philadelphia
138 Washington Street, No., Boston

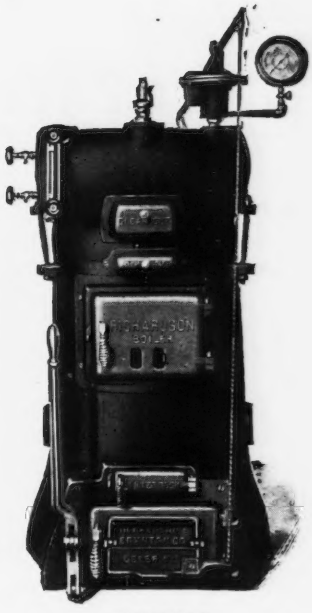
Pacific Coast Agents:
HOLBROOK, MERRILL & STETSON
Oakland, Los Angeles and
San Francisco, Cal.

Central Western Agents:
Continental Radiator & Foundry Co.
1409-1411 Olive St., St. Louis, Mo.

European Agents: AUGUST EGGERS
Bremen and New York

RICHARDSON ROUND BOILERS

HOT WATER



STEAM

Powerful, Efficient, Economical

Easy to Erect, Conservatively Rated

RICHARDSON & BOYNTON CO.

MANUFACTURERS

232, 234, 236 Water Street

BOSTON *NEW YORK* CHICAGO

"CROOKED WORK MADE EASY"

Slotted Angle Flanges will make any angle up to and including ten degrees. Any angle up to the maximum can be made simply by shifting the two flanges to the desired position. The slot in the bolt circle gives bolt hole for any position, and after adjusting to the desired angle fitting is made up in usual manner.

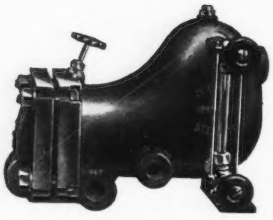
Method of Making Angle with Slotted Angle Flange.

AMERICAN DISTRICT STEAM CO.

Lockport, N. Y. N. Tonawanda, N. Y. Chicago

McDaniel Improved Steam Trap

WILL DO THE WORK



When you need a Steam Trap buy one you know will work. With a McDANIEL we take all the chances. Don't pay until you are satisfied. We have been 25 years manufacturing Steam Traps and know there is no better trap made. May we send you one for trial?

Watson & McDaniel Co.

160 North 7th Street - PHILADELPHIA, PA.

Send for Catalogue

"KINEALY"

AIR PURIFIER and HUMIDIFIER

Wherever you see this name it means the best.

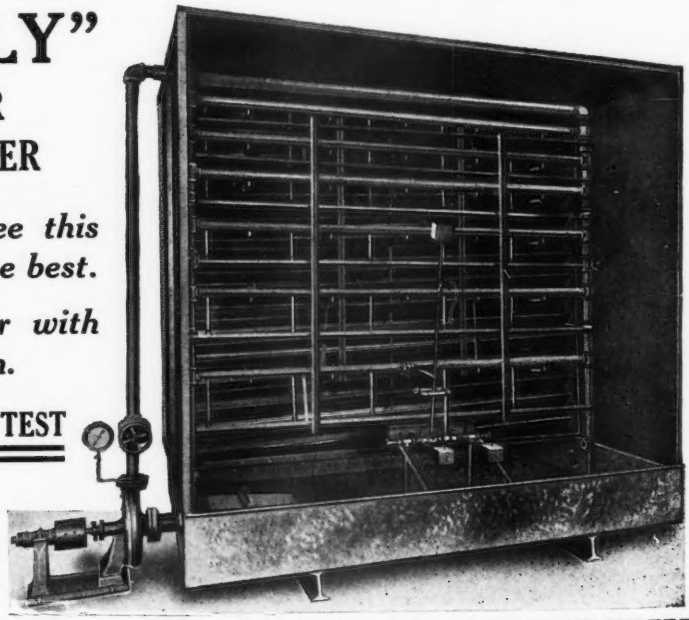
Ask any engineer with a reputation.

BEST BY EVERY TEST

IT'S AUTOMATIC THROUGHOUT

LET US SHOW YOU.

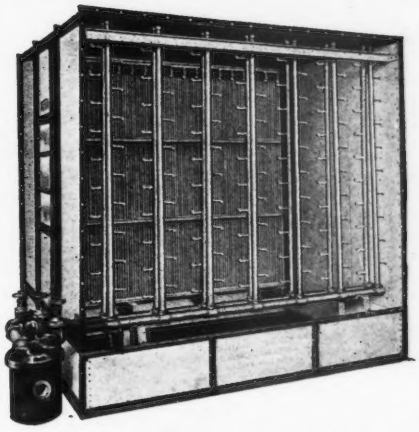
Write for Catalogue.



Kauffman Heating and Engineering Co. 2322 OLIVE STREET, ST. LOUIS, MO.

NEW YORK	CHICAGO	PHILADELPHIA	BOSTON	PITTSBURG
Dewitt T. Lyon	Cuthbert Schaefer	Snyder & Raub	Herbert A. Joslin	Jno. T. Bealor
39 Cortlandt St.	First Nat'l Bank Bldg.	1847 N. 6th St.	53 State St.	1101 Keystone Bldg.
ATLANTA	KANSAS CITY	ST. PAUL	INDIANAPOLIS	SALT LAKE CITY
H. Clay Moore	Qualtrough Engineering Co.	Dwyer Field Co.	T. E. Keegan	Thos. A. Williams
Empire Bldg.	Reliance Bldg.	Am. Nat'l Bank Bldg.	Board of Trade Bldg.	Scott Bldg.

The Carrier Air Washer and Humidifier



Carrier Air Washer and Humidifier

THOROUGHLY washes all air passing through it, removing all solid particles of dust and soot.

Removes all free moisture held in suspension as a result of washing process.

Maintains automatically any desired humidity in the building accurately by thermostat control.

Supplies automatically and instantaneously the exact quantity of steam required for evaporation of moisture governed by the requirements of the thermostat.

Does over one-half the tempering of air, thus eliminating the usual heating coil in front of the washer with great gain in efficiency.

Cools air passing through it in Summer without the use of cold water.

CARRIER AIR CONDITIONING CO.
OF AMERICA

39 Cortlandt Street (123-C) NEW YORK

THE

Ventilation Laws

OF THE STATES OF

MASSACHUSETTS NEW JERSEY
NEW YORK PENNSYLVANIA

INCLUDING NEW YORK AND ILLINOIS
STATE FACTORY VENTILATION LAWS

Comprising all the statutes now in force in this country regulating the ventilation of school and other public buildings

BOUND IN VEST POCKET SIZE

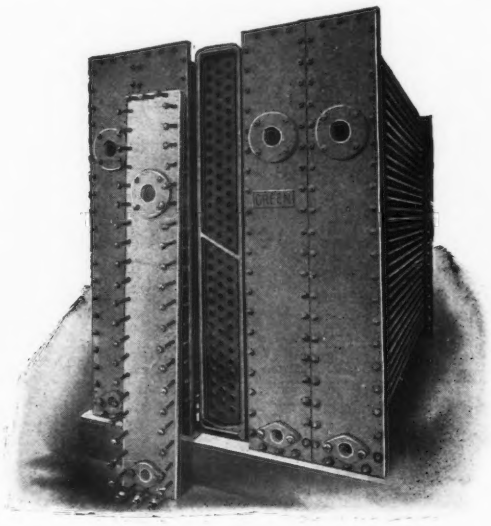
Price, 15 Cents net, or 17 Cents, Postpaid

ADDRESS THE PUBLISHERS

Heating and Ventilating Magazine Co., 1123 Broadway, New York

ABOUT STEAM AIR HEATERS

HAVE you ever noticed the design of steam air heaters? Did you observe that in most of them the steam does not circulate positively; in other words, the steam could pass directly from the inlet to the outlet, and that the pipes are joined in loops that make nice air pockets, so that the air can collect and keep out the steam?



The Green Steam Air Heater has positive circulation, the current must flow straight ahead through half the tubes and back through the other half. The flow of the steam is in the same direction as the drainage of condensation; therefore there will be no water hammer, and all air is carried along by the steam. As there can be no clogging by air, all the surface is active in transmitting heat.

This heater can be used as well for hot and cold water or cold brine or with steam. If oily steam or dirty water is used, every tube can be inspected and cleaned by removing the cover plates, and, if by accident any tube should be damaged, it can be removed or plugged with equal facility.

We not only supply this apparatus, but we have accurate data as to the most economical ways of installing it, the best air velocities and best depth of coils, etc. We also supply the engineering experience and knowledge necessarily connected with the installation of Green Fans and Blowers and of air distributing systems.

Submit your problems in heating and ventilating, drying, mechanical draft, heat recovery, etc., and ask for booklet "122 H."

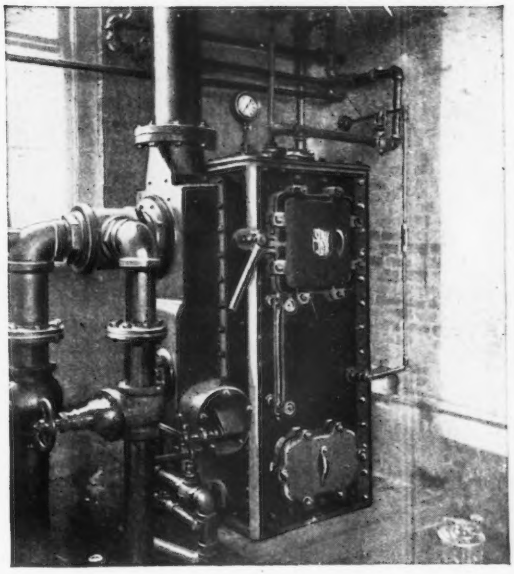
The Green Fuel Economizer Co.

MATTEAWAN, N. Y.

New York City, Boston, Chicago, Atlanta, San Francisco
Los Angeles, Seattle, Salt Lake City, Montreal

Engineers; Builders of Green's Fuel Economizers, Fans, Blowers and Exhausters, Steam Air Heater Coils, Waste Heat Air Heaters, Mechanical Draft, Heating and Ventilating and Drying Apparatus, Draft Dampers and Engines.

185



$50 TO $500

No Matter What System Of Exhaust Steam Heating

is adopted, you can save $50 to $500 by using in connection with it the **new Cochrane Surplus-Exhaust Feed Water Heater and Receiver.** This amount of money will be saved on the first cost of the installation as compared with any other type of feed water heater equipped for use in connection with an exhaust steam heating system.

The new heater embodies all the valuable features heretofore employed in **Cochrane Heaters and Receivers,** with the addition of an attached oil separator that provides not only for purifying the exhaust steam condensed in heating the boiler feed water, but also the surplus exhaust that goes to the heating system or to atmosphere. As a consequence, it is not necessary to provide an independent oil separator and trap in order to protect the heating system from fouling by oil, or in order to be able to utilize the condensed returns as boiler feed.

The new Cochrane Surplus-Exhaust Heater and Receiver fits in perfectly with any system of exhaust steam heating or drying now on the market. It displaces not only the feed water heater, but also the expansion and return tanks, receiver and pump, independent oil separator and trap, and a multitude of tees, valves and other fittings which are otherwise required for the proper installation of a heating system.

Our 48-page book No. **"4-E."** illustrates nearly a dozen of the best known commercial heating systems, and might be of interest; ask for it.

HARRISON SAFETY BOILER WORKS

3189 N. 17th Street **Philadelphia, Pa.**

WASHED AIR FOR BANKS

Here is a list of representative banking houses that are not satisfied with using the dusty, smelly air of the street to ventilate the rooms on which so much money has been expended for decoration, and in which so many valuable workers must live.

BANK OF COMMERCE.....Kansas City, Mo.
CHICAGO NATIONAL BANK.....Chicago, Ill.
COMMERCIAL NATIONAL BANK.....Chicago, Ill.
COMMONWEALTH TRUST CO. Philadelphia, Pa.
CORN EXCHANGE NATIONAL BANK...Chicago, Ill.
FARMERS' & MERCHANTS' BANK.Minneapolis, Minn.
FIRST NATIONAL BANK.....Chicago, Ill.
" " " .....Cleveland, O.
" " " .....Kansas City, Mo.
" " " .....Boston, Mass.
" " " .....St. Paul, Minn.
GUARDIAN TRUST BUILDING.....Cleveland, O.
IMPORTERS' & TRADERS' NAT'L BANK N. Y. City
JENNINGS DAY AND NIGHT BANK...Chicago, Ill.
KUHN-LOEB & CO.....New York City, N. Y.
LACLEDE NATIONAL BANK.....St. Louis, Mo.
LAND & TITLE BUILDING.....Philadelphia, Pa.
NATIONAL GERMAN-AMERICAN BANK, Wausau, Wis.
NORTHWESTERN BANK BLDG...Minneapolis, Minn.
NOVA SCOTIA BANK.....Toronto, Ont.
OLD COLONY TRUST BUILDING.....Boston, Mass.
SUFFOLK BANK.....Boston, Mass.
THIRD NATIONAL BANK.....Chicago, Ill.
WESTERN GERMAN BANK.....Cincinnati, O.

Architects and owners interested in what washed air will do in any building or any room are invited to use our engineering department.

The experience of over two hundred successful air washer installations is at your disposal.

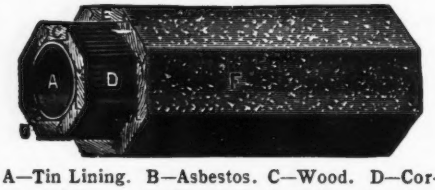
THOMAS & SMITH, 17-19 So. Carpenter St., CHICAGO

New York, 288 Hudson St.....L. THOMAS
Cleveland, Hickox Bldg....McDONALD BROS.
Detroit, Majestic Bldg.....McDONALD BROS.
Minneapolis, Security Bank Bldg.,
GEORGE A. YOKOM CO.
St. Louis, Chemical Bldg....T. J PETERS CO.
Kansas City, Mo., Postal Bldg.,
KANSAS CITY ENGINEERING CO.
Pittsburg, 1101 Park Bldg., J. A. LEIENDECKER
Boston, 88 Broad St...BENJAMIN K. HOUGH
Philadelphia, Bailey Bldg.,
THOS. KOLISHER ENG. CO.

Wyckoff Patent Steam Pipe Covering

It is the best made for underground or exposed pipes, because—

(A) It is made with tin next to the pipe, then with a layer of asbestos paper, then layer of pine, so arranged as to furnish an air space between, then corrugated insulating paper, then another layer of pine, giving another air space, all covered with special preparation of asphaltum pitch.



A—Tin Lining. B—Asbestos. C—Wood. D—Corrugated Paper. E—Wood. F—Asphaltum Coating.

(B) It is waterproof.

(C) It is easily put on and easily removed. (D) Experience shows that it saves more steam than any other covering.

It Is Time to Order Now for the Season
References and Prices on Request

A. WYCKOFF & SON CO., "Box A" Elmira, N. Y.

The Heating and Ventilating Magazine

VOL. VI No. 9

Contents for September, 1909

Use of Ozone Generators in the Ventilation of Buildings 1

The Significance of Drafts in Steam Boiler Practice - 4

Heating and Ventilating System, Finney Chapel, Oberlin College - - - - - *B. S. Harrison* 7

Modern Methods of Pipe Insulation - *L. O. Hodge* 13

The Effect of Painting Radiator Surfaces *John R. Allen* 15

Examples of Wind Effects on Ventilation and Heating *H. W. Whitten* - - - - - - - - 18

A Defense of the Warm Air Furnace - *Chas. S. Prizer* 20

The Engineer and the Modern Building *Wm. H. Bryan* 25

Methods of Piping Heaters and Receivers in Connection with Exhaust Steam Heating and Drying Systems 30

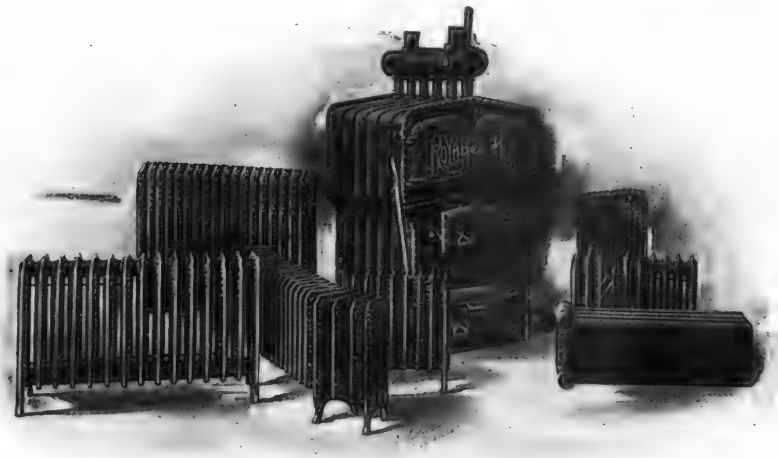
A New System of Temperature Regulation - - - 33

The Weather for July, 1909 - - - - - 34
New York, Boston, Pittsburg, Chicago and St. Louis

Current Heating and Ventilating Literature - - - 36

YEARLY SUBSCRIPTION, $1.00 **SINGLE COPIES, 10 CENTS**

Published monthly by the Heating and Ventilating Magazine Co., 1123 Broadway, New York.



Let us send you a few copies of "Heating and Ventilating the American Home"—an article in booklet form. You can distribute these to advantage among prospective homebuilders in your town.

HART & CROUSE CO.

Home Office: Utica, N. Y.

BRANCHES:

New York, 41st St. and Park Ave.
Chicago, 80 Lake St.
Dallas, 659 Elm St.
Columbus, Poplar and Henry Sts.
Minneapolis, Exchange. 742 Lumber

SUNRAY HEATERS

Can Be Shipped Promptly

No. 960 SUNRAY BOILER

THE J. L. MOTT IRON WORKS

NEW YORK
CHICAGO
BOSTON

THE HEATING AND VENTILATING MAGAZINE

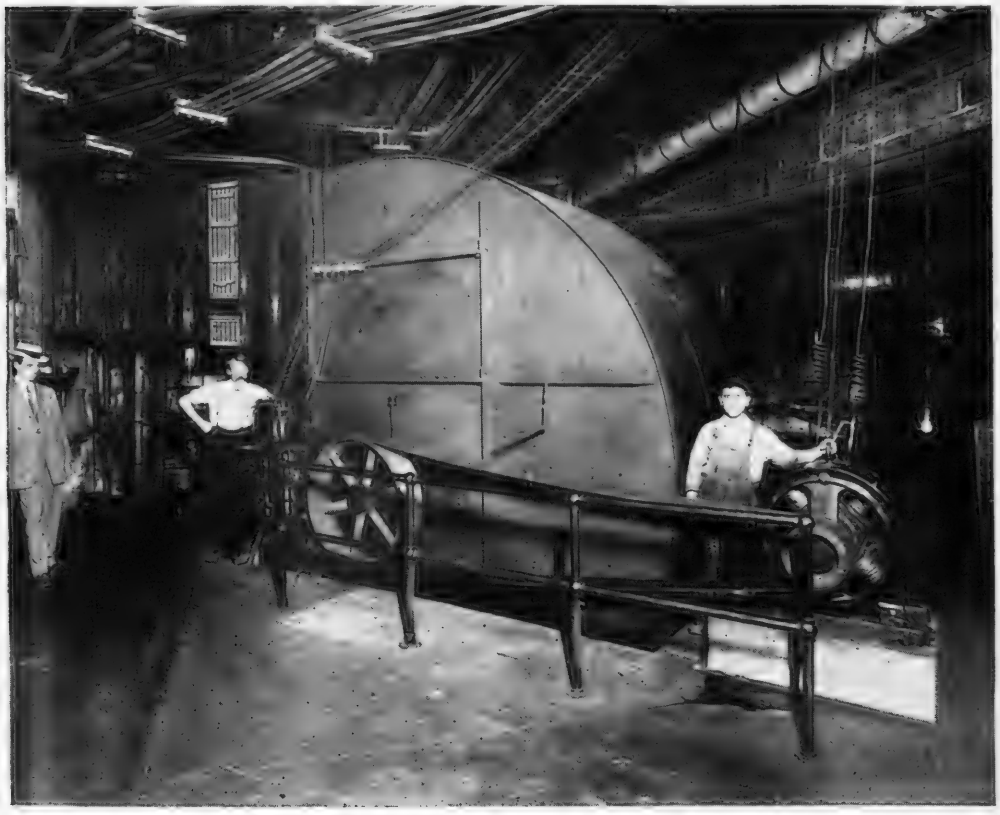
1123 BROADWAY NEW YORK SEPTEMBER, 1909

Use of Ozone Generators in the Ventilation of Buildings

Installation in the Chicago Public Library

For some weeks past a test of great importance has been made in adapting ozone generators to ventilating systems in large buildings. This demonstration is unique in so far that it is the first actual ozone apparatus installed in a large air duct—used wholly to convey fresh air to various rooms in a large building.

The test above referred to, started the first of August and has been in continued operation ever since. In selecting the Chicago Public Library building for this test, the National Air



VIEW OF BLOWER, CHICAGO PUBLIC LIBRARY, SHOWING INSTALLATION OF OZONE GENERATOR

Filter Company, manufacturers of the ozone generator, showed unusual faith in their apparatus when it is considered that 10,000 cu. ft. of air per minute has to be ozonized complete, so that it will be detected in the most remote part of each room, having leaders to it from the main air duct.

BAD AIR LONG A SUBJECT FOR COMMENT

The foul air in the Chicago Public Library main reading room, has been the source of much adverse comment and discussion for years, and only last March, Dr. W. A. Evans, health commissioner of Chicago, in addressing a large audience in the lecture room, stated that the air in the library building was entirely unfit for use, being foul and dangerous.

Perhaps no public building in the city has been subjected to so much condemnation on its ventilating system, as the library, and it is, no doubt, gratifying to the authorities that they have at last found a solution for this troublesome condition.

WHAT HAS BEEN ACCOMPLISHED

Just what has been accomplished, is this—

1. The complete deodorizing of the main reading room, freeing from the air that obnoxious personal aromatic odor which has for years so thoroughly permeated all papers, books, furnishings, etc., in this large room.

2. The injecting of absolutely fresh sterilized air in the room at all times and reducing the humidity in the various rooms during hot and oppressive days of last summer.

3. The disinfecting of all books, periodicals, etc., on shelves, racks and tables which are of easy access to the public at all times.

4. The perfect comfort at all times that is experienced now when occasion requires a visit to the large reading room and other rooms where, formerly, it was impossible and unendurable most of the time on account of the lack of fresh air and offensive odor at all times present.

The demand for fresh air is, of course, much greater in the winter than in summer, in the reading room. The average attendance is 400 in the winter months and 200 in the summer months.

The air ducts of the ventilating system being so complex in the library building, it affords only the north portion of the building for demonstration, but inasmuch as the ozone generator installed in the air duct in the basement, proved of sufficient size, capacity and efficiency, little remains now to be done in equipping the other remaining air conveyors with similar ozone generators.

The ozone generator installed in this large air duct, measuring 6 ft. x 9 ft. is the largest unit built for this purpose, consuming about 6.5 amperes of electric current per hour with a discharge of more than 15,000 cu. ft. per minute.

In dimensions the generator is 6 ft. high, 11 in. thick and 1 ft. wide, encased and inserted in the opening of the duct to permit the suction of air to pass through it, thereby becoming charged completely, with ozone. By placing the ozone generator between the fan and spray of water (used in washing the air) greater efficiency was obtained than in placing it in front of the spray and thereby losing a large percentage of ozone which the water would naturally take up. It should be added that the generator is the result of the work of S. C. Shaffner and S. T. Hutton, electrical engineers of Chicago, who combined their ideas and developed the ozone generator to its high state of efficiency.

From a feed wire of 110 volts, a connection is made to a step-up transformer which discharges the current at a voltage of about 7,000 volts, which feeds into the series of electrodes, which are in the form of ordinary hair brushes. A static electrical charge is maintained, playing against series of glass plates. Through this blue electrical discharge of 7,000 volts, air is forced, electrocuting all bacteria, germs, etc., giving forth a purity of ozone gas of 97.1%, the highest and purest yet obtained. When the filtering electrodes become dirty or clogged, they are easily rubbed together and cleaned as one would clean

INSTALLATION OF OZONE GENERATOR IN CHICAGO PUBLIC LIBRARY

two hair brushes. Placed back in position they are as good as new and will generate their full capacity.

Ozone has just been found to completely deodorize stale milk, cream, butter and other cream products, and several large creameries are using it in their plants in Chicago, employing in each case, an ozone generator especially designed for the purpose.

Other uses of ozone are constantly being added to the already long list, such as the aging of wine, curing of tobacco leaf, tanning hides, purifying water, etc., etc. Already a large number of offices are equipped with various sizes of these generators in Chicago and elsewhere. Especially have these generators met with remarkable success in New York where apparently the public has taken to them more quickly than in Chicago.

The Significance of Drafts in Steam Boiler Practice

From a large number of recent tests, the government experts have come to the conclusion that it is possible to double or treble the capacity of steam plants without making any radical changes in the furnaces and boilers. The increases require about double and treble the quantities of air to be put through the fuel beds and boilers. It also seems probable that rebaffling the boilers will often permit the capacity to be doubled or trebled, while still getting more steam than formerly per pound of coal for uses outside the boiler room.

The writers of a recent report on the subject, Walter T. Ray and Henry Kreisinger, have some interesting things to say about the subject of draft generally and record their objections to the use of the term, as ordinarily used.

"This terms," they say, "is sometimes applied to the motion of gases and sometimes to the difference of pressure producing the motion. To speak of draft being absorbed by sharp turns can not mean anything else than that the velocity of the gases is reduced. To speak of a draft of 1 in. of water can not mean anything else than that the difference between the pressures at two points is sufficient to support a column of water 1 in. high. The vague term draft probably originated from the mistaken idea that something was pulling or drawing the gas. There is really no such motive power effective in the movement of gases, as the following argument will show."

In the steam-boiler furnace the hot fuel is made to burn by passing a current of air through it. This current of air supplies the necessary oxygen and carries away the gaseous products of combustion. In order that the boiler may absorb the heat generated by combustion and contained in the gases leaving the fuel bed, the gases are caused to flow along the heating plates of the boiler and to impart heat to them by coming into contact with their surfaces. The stronger the current of air through the fuel bed the higher the rate of combustion, and, likewise, the stronger the current of gases over the heating surfaces the faster the boiler seems to absorb heat.

It is thus evident that the motion of the air and of the gases of combustion is very essential to the operation of a furnace and boiler. The motion of gases is produced by an excess of pressure at any point over that at any other point toward which the gases are flowing; the greater the pressure difference the higher the velocity of flow.

THE WORD "DRAFT" LOOSELY APPLIED

The word "draft" is loosely applied sometimes to the motion of gases and sometimes to the difference of pressure producing the motion. A moment's consideration of the likelihood that a gas is a discontinuous body will make it clear that there can really be no such motive cause as "draft."

There are three ways of producing such differences of pressure as will cause gases to flow through the fuel bed and boiler—(1) by chimneys, (2) by exhausting fans between boilers and chimneys, and (3) by pressure fans supplying air under the grate.

1. The use of high chimneys is most common. They reduce the pressure inside their bases so that the greater pressure of the atmosphere outside pushes air through the fuel bed and gases of combustion through the boilers into their bases. The reduction of pressures is due to the fact that gases expand when heated, in consequence of which the chimneys contain smaller weights of gases than they would if chimneys and gases were cold. We then have the weight of a column of hot gases in the chim-

ney pressing against the gases in the uptake, and the weight of a column of air of the same dimensions and at atmospheric temperature pressing against the air in the ash pit.

Referring to the figure, let w be the weight of a column of hot gases in the chimney, and W the weight of a column of outside air of the same dimensions; then the difference (d) between the pressures in the ash pit and the uptake will be the difference between the weights of these two columns when both

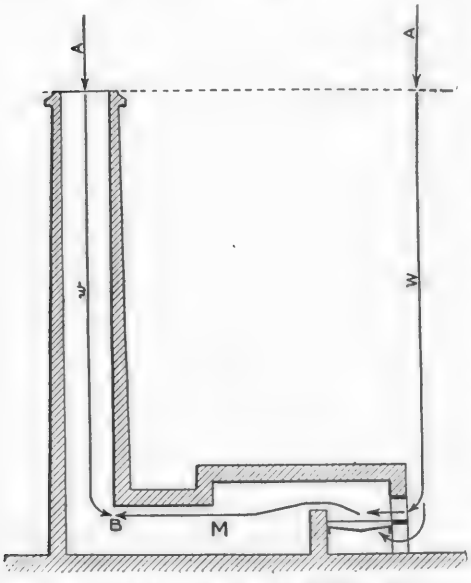


ILLUSTRATION OF PRINCIPLE OF CHIMNEY DRAFT

have unit area of cross section, or $d = W - w$.

The same equation will be obtained if we include in the calculations the weights of the columns of air above the chimney and above the aforementioned imaginary column of cold air outside the chimney. Let the weights of these columns be A; then the total weight pressing against the ash-pit door is $A + W$ and the total weight pressing against the gases in the uptake is $A + w$. Therefore, the difference, $d = A + W - (A + w) = W - w$, as before.

As a result of this difference of pressure, the outside air pushes the furnace gases into the chimney and through it into the high open atmosphere. The air which has been pushed through the fuel bed into the furnace is partly modified by the combustion, which produces more furnace gases, which are in turn pushed out through the chimney into the open air.

It is evident that the hotter the gases in the chimney the more they are expanded and the lighter they are, and the greater is the difference of gas pressure between the front of the furnace and the base of the chimney; also that the higher the chimney the greater is the difference of pressure.

The heat energy left in the column of gases escaping from a boiler is not entirely wasted, as part of it is used in keeping up the continuous current of gases. By raising the temperature of the gases the same difference of pressures between the uptake and the front of the furnace can be had by a low chimney as by a high one, although such a method would not be economical. Anything which reduces the temperature of the gases while in the stack reduces the magnitude of the pressure difference between the chimney base and the furnace doors; on this account less coal can be burned and less steam made. It follows that a steel stack without any brick lining on the inside is, on account of the high thermal conductivity of the steel, not as efficient as a brick one, provided the latter is absolutely tight, as is seldom or never the case.

2. Another common method of reducing the gas pressure in the uptake of a boiler setting is by an exhaust fan. Usually it is said that the exhaust fan sucks or pulls the gases through the boiler; in reality no such action can occur. The blades of the fan push the gases out of the casing, thereby reducing the pressure in it below that in the furnace; the excess of pressure in the furnace then pushes other gases through the boiler into the space

of reduced pressure inside the fan casing, and so the current continues.

3. Another way of producing an excess of gas pressure under the grate over that in the uptake is by connecting a pressure blower or fan to the space under the grate, so as to increase the pressure therein above that of the atmosphere. In some cases the whole fireroom is put under pressure. This method is ordinarily termed the "forced-draft" method, in contradistinction to the "induced-draft" method. There is, however, no essential difference between the two. Occasionally they are used together.

In practice the pressures of the gases in the various parts of the boiler setting are measured by instruments called draft gages, the pressures being usually expressed in inches of water. The zero points are or should be atmospheric pressure. With an exhaust fan between the uptake and the stack the pressure anywhere in the boiler setting is below that of the atmosphere and is lowest at the edges of the blades next the shaft. With a pressure fan applied to the ash pit or fireroom the pressure under the grate is above that of the atmosphere. At the top of the stack the pressure is always just atmospheric, and at the base of the stack it is sometimes above and sometimes below atmospheric.

The drop of gas pressure from one part of the boiler setting to another varies as some power of the resistance to the flow of gases. Thus a great drop from ash pit to furnace indicates a high resistance in the fuel bed, and a great drop from the furnace to the uptake indicates a high resistance to the flow of gases through the boiler proper. This law, which in some respects is similar to Ohm's law, as applied to problems involving the electrical resistance of conductors, may be stated as follows:

(a) If the resistance to the flow of gases remains constant the pressure drop through any portion of the path of the gases will have a constant ratio to the total drop from the ash pit to the uptake. Thus, for example, if the pressure drop through the fuel bed is 0.50 in. of water when the total drop is 1.0 in., it will be 1.0 in. if the total drop be increased to 2.0 in., and 2.0 in. if the total drop be increased to 4.0 in. of water.

(b) If the total pressure drop from the ash pit to uptake remains constant, the pressure drop through any portion of the gas path will vary in the same direction as does the resistance to the flow of gases, although the magnitudes of the variations may not be in simple proportion. Suppose the total pressure drop is 1.0 in. of water, and the drop through the fuel bed is 0.5 in.; now, if the total drop be kept the same but the resistance through the fuel bed be increased by doubling its thickness, the pressure drop through the fuel bed will increase to about 0.65 in. of water; or if, for the same total drop, the resistance of the fuel bed be increased by quadrupling the thickness, the drop through the bed will increase to about 0.80 in. of water.

(c) When the resistance through any portion of the gas path remains constant the weight of gas passing through this portion varies with some power of the pressure drop through this portion. Thus, since the resistance of that portion of the gas path from over the fuel bed to the uptake is ordinarily very nearly constant, the weight of gases passing through the furnace and boiler varies as some power of the pressure drop between these points. Approximately only, the weight of gases passing through the boiler is directly proportional to the square root of the pressure drop through the boiler or through any other portion of the gas path having constant resistance.

Of the above three statements, only the one under *a* is exactly parallel to Ohm's law of the drop

of electrical potential through conductors of constant resistances.

The relation between drops of pressure and the resistance to the flow of gases expressed by the statement under *b* is similar to Ohm's law only in the direction of the variation, not in its magnitude. In Ohm's law the relation between the drop of potential through any portion of the conductor and the resistance is very simple; that is, the drop of potential is directly proportional to the resistance. In the case of the flow of gases, however, the analogous relation between pressure drop and resistance seems to be either an exponential or a logarithmic function. In fact, no definite relation can be stated at present because the unit of resistance is not clearly defined.

The statement under *c*, expressing the relation between the pressure drop and the weight of gas passing through a furnace and boiler, comes closer to Ohm's law than that made under *b*. If the exponent of the power were 1.0 the relation would reduce to Ohm's law; that is, when drop of pressure is considered as drop of potential and the weight of gases flowing per second as the current.

---

*Heating and Ventilating System, Finney Chapel, Oberlin College, Oberlin, Ohio**

By B. S. Harrison

In laying out the systems of heating and ventilation for this building, the following conditions controlled:

Steam was to be taken from the street mains of the American District Steam Co., at a pressure of between ½ lb. and 5 lbs. gauge. The building to be in use (in part or in whole) for short intervals, with long intervals between of no heat. It was desired to be able to heat up quickly in part or in whole. Ventilation was imperative at times and at other times not desired. The first cost and the annual operative cost were both important items.

For the above reasons the systems adopted and laid out as shown by the accompanying sketches were, a single pipe system of low pressure steam direct radiation, supplemented with a fan blast system and a fan exhaust or vent system. The 7-in. steam supply main from the street is pitched to drain back to the street main until a point is reached under the tower of the building where the main rises to the first floor beams and then pitches to the fan room where it is bled to a trap.

In the apparatus room three branches are taken from the main with valves where they leave the main. One feeds the blast coils and two of them supply the direct radiation of the building. The single pipe mains are pitched with the flow of steam and a condensation return line taken from the end of each run. All risers to radiators on the first floor and balconies are taken off single pipe and dripped back into the mains.

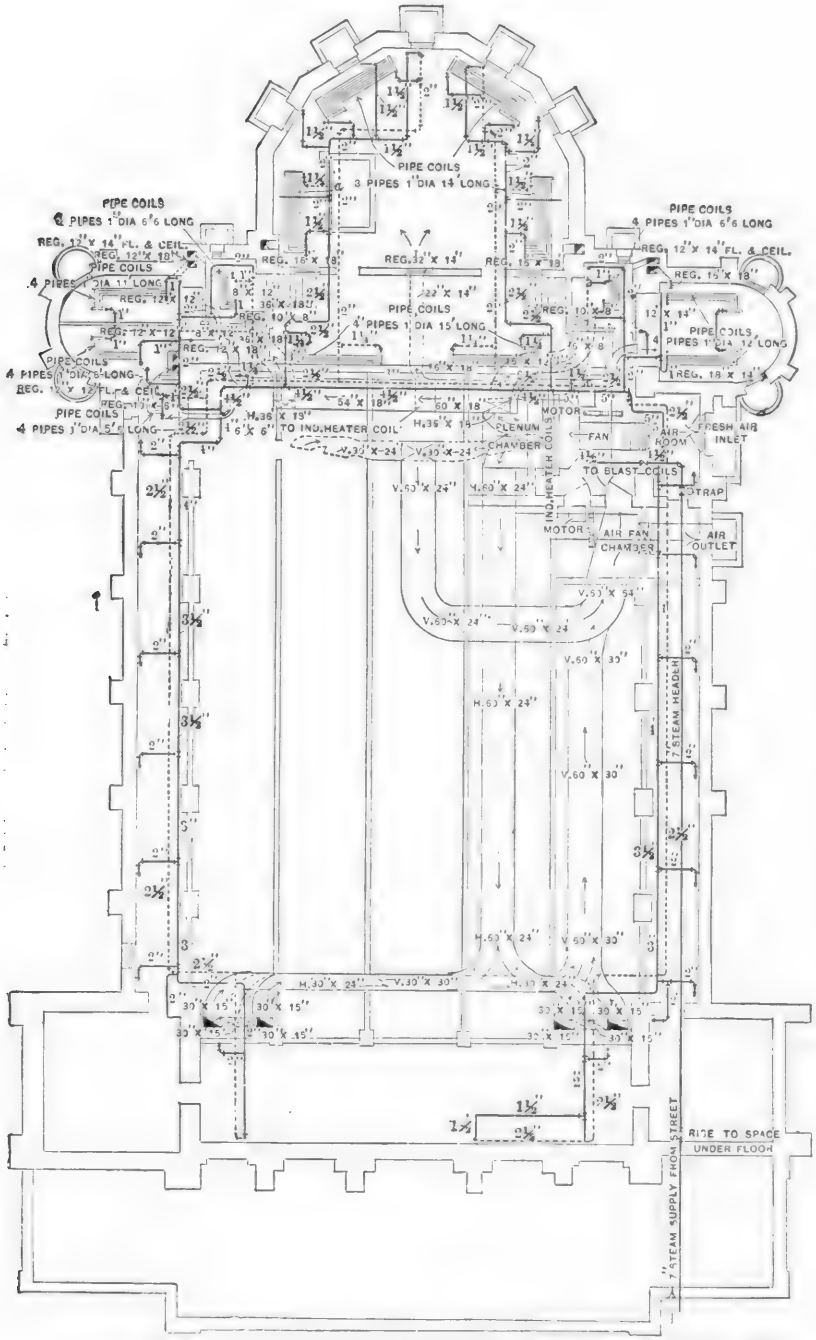
The branches for ceiling coils in the choir room and anterooms under the apse are taken off with two pipe connections, the condensation returns being connected into the returns from the ends of the single pipe mains.

All direct radiators in the first floor and balconies are connected up at both ends with a blind nipple between the 4th and 5th loops of a 12 loop radiator thus dividing it into 1/3 and 2/3. Air valves are placed on the 4th and 5th loops.

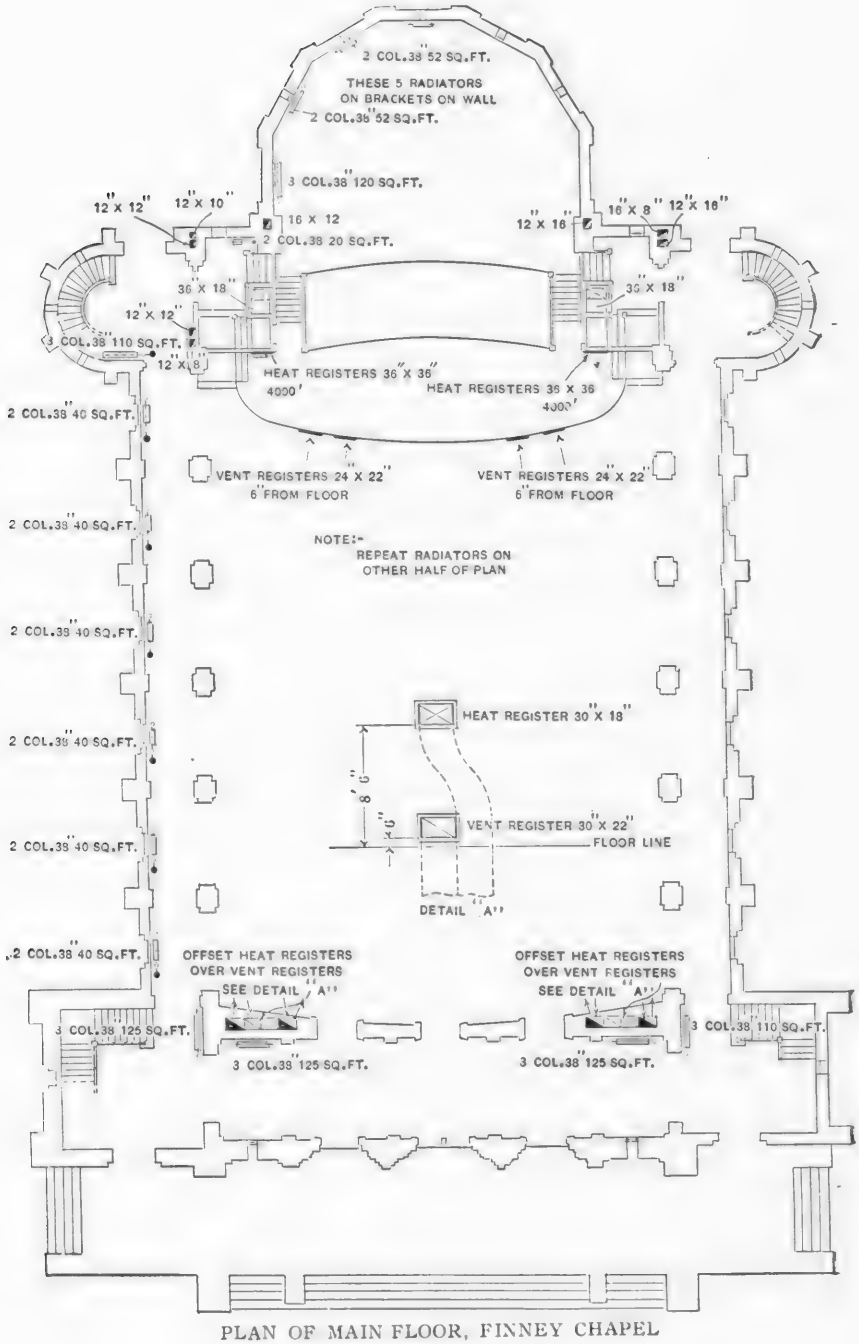
The fan blast system is arranged so that in warming up the building the air may be recirculated by closing the air outlet doors of the vent fan chamber, closing the fresh air inlet doors of the heating fan chamber and opening the door between the two fan chambers.

The heating fan is arranged in a

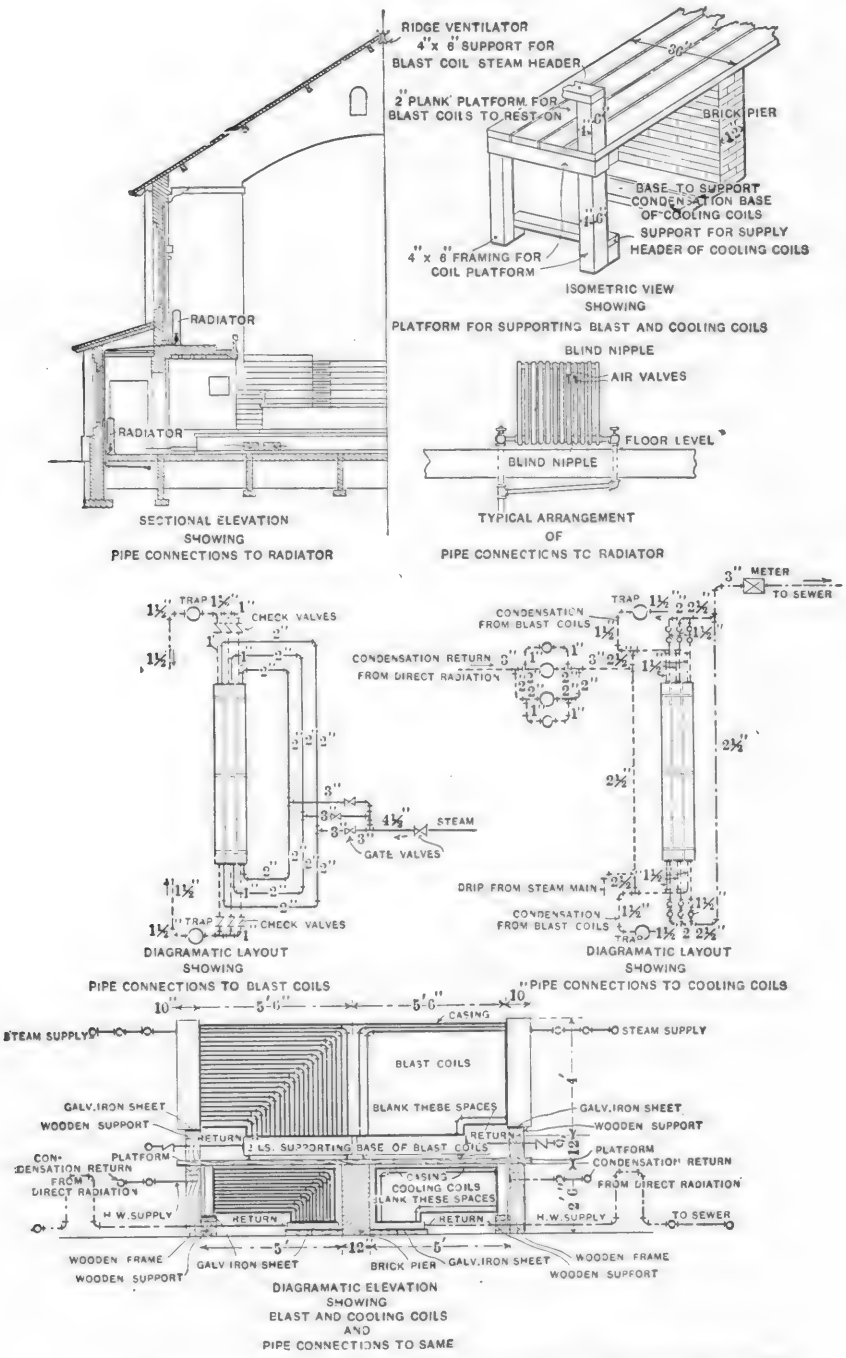
*Read before The American Society of Heating and Ventilating Engineers, at Indianapolis, July 15, 1909.



PLAN OF BASEMENT, FINNEY CHAPEL, SHOWING HEATING AND VENTILATION LAYOUT


2 COL.38" 52 SQ.FT.
THESE 5 RADIATORS ON BRACKETS ON WALL
2 COL.38" 52 SQ.FT.
3 COL.38" 120 SQ.FT.
12" X 12"
12" X 10"
16" X 12"
2 COL.38" 20 SQ.FT.
12" X 16"
16" X 8"
12" X 16"
36" X 18"
36" X 18"
12" X 12"
3 COL.38" 110 SQ.FT.
12" X 8"
HEAT REGISTERS 36" X 36" 4000'
HEAT REGISTERS 36" X 36" 4000'
2 COL.38" 40 SQ.FT.
VENT REGISTERS 24" X 22" 6" FROM FLOOR
VENT REGISTERS 24" X 22" 6" FROM FLOOR
2 COL.38" 40 SQ.FT.
NOTE:- REPEAT RADIATORS ON OTHER HALF OF PLAN
2 COL.38" 40 SQ.FT.
HEAT REGISTER 30" X 18"
2 COL.38" 40 SQ.FT.
8" 6"
VENT REGISTER 30" X 22"
FLOOR LINE
2 COL.38" 40 SQ.FT.
DETAIL "A"
2 COL.38" 40 SQ.FT.
OFFSET HEAT REGISTERS OVER VENT REGISTERS SEE DETAIL "A"
OFFSET HEAT REGISTERS OVER VENT REGISTERS SEE DETAIL "A"
3 COL.38" 125 SQ.FT.
3 COL.38" 110 SQ.FT.
3 COL.38" 125 SQ.FT.
3 COL.38" 125 SQ.FT.

PLAN OF MAIN FLOOR, FINNEY CHAPEL



DETAILS OF HEATING AND VENTILATING SYSTEM, FINNEY CHAPEL

blow through rig with mitre type of 1 in. blast coils. The condensation from the steam blast coils, from the direct radiation system and the drip from the steam supply main are all passed through low pressure traps into a hot water coil group under the steam blast coils, as shown on the sections. The heated air from the fan system is introduced into the auditorium at about 8 ft. 6 in. from the floor and the foul air is taken out at the floor line. Hand control is used throughout.

The steam blast coils are 12 rows deep, they are double group 4 ft. by 5 ft. sections, the total steam coil surface being 2700 lin. ft. actual, with a total free area through the double group of 2400 in. The fan is 6 ft. by 3½ ft., three quarter housed, driven by an A. C. 220 Volt, 60 cycle, 2-phase motor connected to the fan by means of a Morse silent chain. The motor has a speed regulation of about 20%. At full speed the fan delivers 24,000 cu. ft. of air per minute. The total free area through the steam and water coils is 22 sq. ft. The velocity of air through them is 1100 ft. per min. At this velocity, with steam at 220° F., and the incoming air at 0° F., the rise of temperature through the steam coils is about 90° F.

The condensation from the steam coils under these conditions is figured at 2000 lbs. water per hour.

The total amount of direct radiation is 4095 sq. ft., and the condensation from same is estimated at 1024 lbs. water per hour at about 200° F.

The water coils are 12 sq. ft. gross area or about 5 sq. ft. free area.

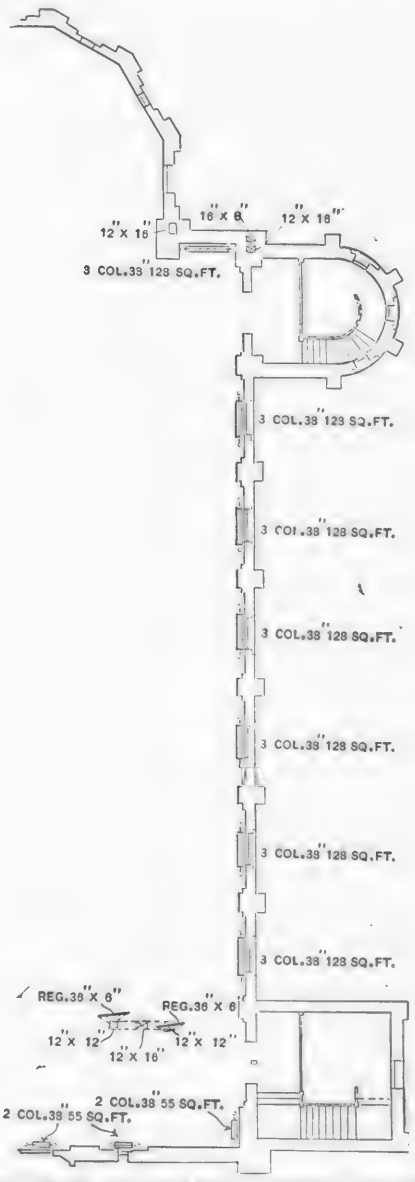
The total condensation to be passed through the water coils is 3024 lbs. water per hour at 200° F.

The amount of air passed through the water coils at 1100 ft. V. P. M. is 330,000 cu. ft. per hour.

If the water in the coils is cooled from 200° F. to 100° F., the air passing through will be heated from 0° F. to 46° F.

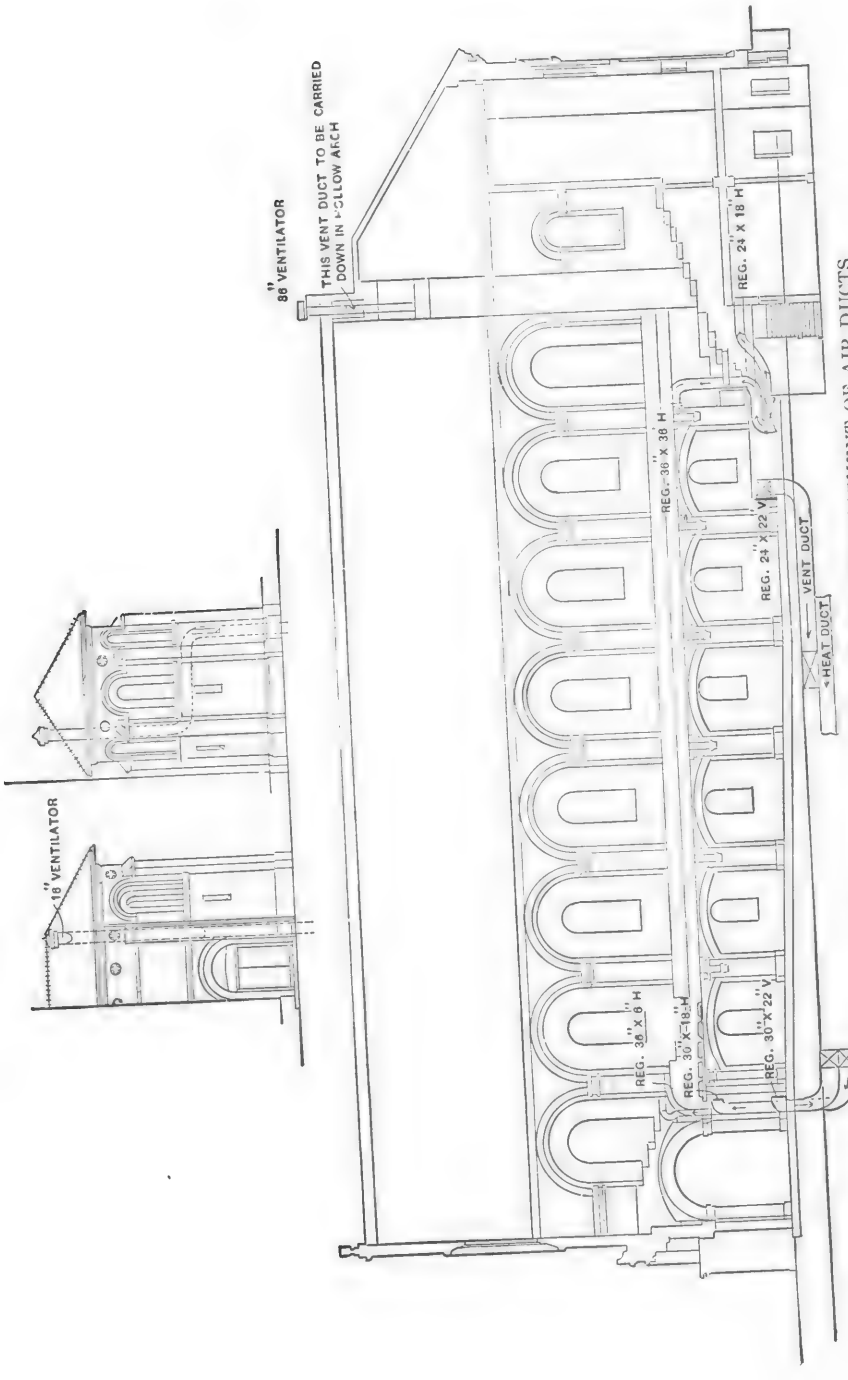
On this basis it was figured that the depth of water coil required was 10 rows, but the coils were made 12 rows deep to preclude the escape of hot water to the sewer under any condition of operation.

The temperature of the air leaving the heater case is controlled by hand regulation of the steam coils.



PART PLAN OF GALLERY, FINNEY CHAPEL

The discharge from the water coils is trapped to the height of the return base of the steam coils to insure the water coils being kept full, and is then passed through the American District Steam Co.'s meter and connected with the sewer.


88" VENTILATOR
THIS VENT DUCT TO BE CARRIED DOWN IN HOLLOW ARCH
REG. 24" X 18" H
REG. 36" X 38" H
REG. 24" X 22" V
VENT DUCT
HEAT DUCT
18" VENTILATOR
REG. 36" X 8" H
REG. 30" X 18" H
REG. 30" X 22" V

SECTIONAL VIEW, FINNEY CHAPEL, SHOWING ARRANGEMENT OF AIR DUCTS

The water coils are bled dry when the system is closed down, by means of hand valves in the bases.

In order to provide a means of gravity ventilation when the fans may be shut down, a ridge ventilator extends the full length of the ridge of the building roof, with butterfly dampers in it controlled by means of cords and pulls from the first floor.

The plant has been in operation over a year and has proven very satisfactory of operation and control, the results being very close to the figures used in laying the work out.

Modern Methods of Pipe Insulation

The subject of pipe insulation was treated in a thorough manner in a paper by Mr. L. O. Hodge, read recently before the Ohio Society of Mechanical, Electrical and Steam Engineers. The principal portions of Mr. Hodge's paper are given herewith:

Heat escapes from a pipe line in two distinct manners, by convection and by radiation. If the air surrounding a pipe is still, very nearly all the heat is lost by radiation, and if it is moving, a large amount of heat is lost by convection. The less convection there is set up about a pipe the less heat is lost by the pipe.

Conductance of different materials varies with the temperature. A substance may be a fairly good insulator at a comparatively low temperature and when heated become a first-class conductor. However, very little is known concerning the conductance of heat at excessively high temperatures.

Conduction is the heating of the molecules, carried on through heated molecules imparting their heat to those contiguous to them. Though specific heats of atoms of all solids are the same, the specific heats of the molecules vary, since the thermal capacities of the latter depend upon the sum of the specific heats of their atoms, since all molecules are not composed of the same number of atoms. It seems that the ratio of the conductance of two different materials ought to be equal to the ratio of the specific heats of their molecules, but this is not the case, because conductance also depends on the construction or "make-up" of the material.

The best insulation known is air confined in minute particles or cells, in such a manner that convection cannot be induced. No insulation can equal or excel that of perfectly still, stagnant air, or any similar gas, and the value of most insulation depends upon the property of the substance to retain minute quantities of dead air, in which circulation cannot be set up.

Other insulating material, such as mineral wool, asbestos paper, loose hair felt, goose feathers, and even silk were also used. Some of these substances, while excellent insulators, were too expensive for such rough work as pipe covering, and have been discarded on that account. Others were not durable or would not withstand the heat, but their combined qualities displayed their usefulness, and emphasized how essential insulation is in all power plant operations whether its function be to prevent the escape or the introduction of heat.

Naturally, great efforts were made to invent forms of insulating material which could be manufactured at a sufficiently low cost to be salable, and at the same time be adapted to the uses to which it is to be subjected, resulting in the development of the present insulating materials—such as magnesia covering and cement, asbestos covering and cement, wool-felt, aircell, cork, etc.

HOW TO SELECT PIPE COVERING

In selecting covering the two important factors to consider are the temperature to which it is to be subjected and its use. It may either be used to prevent the escape of heat or the introduction of heat.

Insulation for steam pipes, boilers, hot air ducts, hot gas conveyers, etc., come under the first class, while insulation for beer pipes, cold brine pipes, ammonia pipes, refrigerators, come un-

der the second class. In general, the first class of insulation must not only be a good non-conductor of heat, but must be capable of withstanding the heat, without losing its insulating qualities or becoming conflagrant. It must also be of such a composition that ordinary jars and vibrations will not cause it to crumble or break.

Insulation of the second class must be a good non-conductor of heat, and also impervious to water, whether the latter be in the form of vapor or a liquid. When water in any form comes in contact with a brine or ammonia pipe, it immediately freezes, and as there is always expansion accompanying its freezing, the covering will be forced away from the pipe and broken. It has only been within recent years that really satisfactory insulation for this class of work has been made.

Cork and air chamber covering are the principal coverings employed for insulating of brine and ammonia pipes. These two, with wool-felt in addition, are employed in covering cold water pipes.

It is evident that the heat lost by radiation or convection depends upon the area of the warm surface exposed, and when considering this fact in connection with insulation, it will be apparent that to increase the thickness of the insulation will also increase the amount of surface exposed, and facilitate radiation and convection to a certain extent. From tests run on covering of the same material subjected to a constant temperature, it has been revealed that within limits the efficiency increases rapidly at first as the covering becomes thicker, and after a certain thickness is reached, the increment of the efficiency becomes less and less with further increase in thickness of covering. The thickness which might be termed the "critical thickness" represents the best relation between efficiency and thickness, and is practically equal to this dimension of standard covering. To apply insulation thicker than the standard, pays, as ordinarily manufactured, and if convenient, should be the practice. Standard covering ranges in thickness for the smallest pipe up to a 12-in. pipe, from 1-in. to 1½-in. thick. Covering of greater thickness, such as 1½-in., 2-in., 2½-in. and 3-in., is manufactured and carried in stock.

INSULATION FOR UNDERGROUND CONDUITS

Underground conduit insulation has been a stumbling block for some time, but recently new forms of conduits have been placed on the market, and it will be but a short while before the line will be perfected. Conduits heretofore have consisted of a series of wooden boxes enclosing the pipe line, or a tunnel lined with brick or stone cemented over, and adapted to contain the pipes and their insulation. Pipe systems which employ the wooden box conduit are insulated by the box alone, a double box, or by filling in around the pipe with loose sawdust, mineral wool or substances of like properties. Insulation and conduits of this sort soon become almost as bad as none, since moisture will gradually find its way through the wooden casing and saturate the contents. The life of the wooden casing is short, and it is difficult to locate leaks in a pipe enclosed by it, and especially is this true when the pipe is insulated by some loose material.

Tunnels are the ideal conduits: the only objection to them is their cost. Leaks in pipes can be located easily, and the insulation is well protected from moisture and the earth.

Pipes which are exposed to the weather must have some protection for their insulation. This protection generally consists of a heavy jacket of tarred felt, well painted with some durable weatherproof paint, or the insulation is covered with a specially prepared covering known to the trade as argentum. Argentum is also used in a similar manner for underground insulation.

Other uses of insulation generally not considered, are the insulating of breeching, and the lining of smokestacks, which aids in securing a good draft for the furnace; thus favoring combustion on the grate. If econo-

mizers are installed in the breeching, whose use is to aid in heating the feed water for the boilers, the efficiency of the plant is also increased by insulating the breeching, as then the feed water is subjected to a higher temperature. It is a well-known fact that the warmer the gases leaving a furnace, the more rapidly they will ascend, and also that the density of the atmosphere varies with the distance from the earth, becoming lighter as the distance increases. Keeping these facts in mind it is evident that to have a high velocity of the flow of the gases, the heat is more desirable higher up in the stack than at its base; for the higher the light gas rises, the nearer and nearer the weight of a unit volume of it approaches a unit volume of the atmosphere. For this reason it is becoming more and more the custom to insulate the inside of stacks, especially those made of steel.

The Effect of Painting Radiating Surfaces

By John R. Allen

The experiments described in this paper* were conducted in the experimental laboratory of the University of Michigan. The apparatus used for testing the radiators has been described previously in connection with the discussion of a paper presented before the society. In conducting the experiments to determine the effect of painting upon the heat transmission through radiators, two flat cast iron boxes were used in place of the radiators.

DESCRIPTION OF THE APPARATUS

The apparatus used may be described as follows: The two cast iron boxes were placed near the inside wall of the room in the same relative position to the outside wall surface. On the floor below steam was admitted to a chamber through a reducing pressure valve. From this chamber, with nearly equal lengths of pipe, steam is conducted to the radiating surfaces. This piping is heavily covered with hair felt. Condensation from the two radiating surfaces is conducted to two chambers which are used to accumulate the condensation. These chambers are provided with gauge glasses so that the condensation in the chambers may be maintained at a uniform level. The condensation is drawn through valves from these chambers to the cooling coils on the floor below. The condensation after being cooled so as to avoid steaming, is weighed in tubs. Valves below the chambers are set so as to obtain as nearly as possible a uniform discharge of water from the chambers. The usual period of time during which tests are conducted was three hours, and before a test was accepted as correct the condensation for two successive hours was compared and a test was not considered satisfactory if the condensation for two successive hours varied more than 2%.

METHOD OF MAKING THE TESTS

The method used in determining the effect of painting the radiating surfaces was to leave one radiator unpainted and paint the other. The heat loss from both radiators was determined in each test, and the ratio of the heat loss of the painted to the unpainted radiator was termed the efficiency. During the tests, readings were taken of the temperature of the steam entering the radiator, of the temperature of the water leaving the radiator, of the steam pressure, of the temperature of the outside air; the moisture condition was determined by a wet and dry bulb thermometer, and the temperature of the room was taken in three different places. Thermometers subject to radiant heat had their bulbs protected with paper cones so as to avoid error. The actual surface of the radiators used was obtained by careful measurements.

READINGS TAKEN

The actual surface of radiator No. 1 was 9.99 sq. ft.; of radiator No. 2

*Read before The American Society of Heating and Ventilating Engineers at Indianapolis, July 15, 1909.

the actual surface was 9.9 sq. ft. The steam pressure maintained throughout the entire test was 4¼ lbs. gauge. All readings given in the following table of results are corrected readings. Corrections were made for steam gauge and thermometers both before and after the test. The following table gives the principal results obtained from these tests.

Column 10 of the table headed "efficiency" gives the heat transmission of radiator No. 2 as compared with radiator No. 1, which has been assumed as a standard and was left unpainted during the test. In comparing the effect of the various coats, the efficiency, as given in column 10, has been taken as a basis of comparison. Tests 1 and 2 were made with both radiators unpainted and an average of the results gives a difference in the heat transmission in the two radiators of .1 of 1%, so that they are assumed as having practically the same heat transmission value.

Lines Nos. 3 and 4 show the effect of painting radiators with two coats of copper bronze for each test. The results of the test show a reduction in the heat transmitted by the radiator of 24%. On top of these four coats of copper bronze two coats of terra cotta enamel were applied. The result of the additional two coats was an increase of 3.8% above the transmission effect of the bare radiator or 28.6% above the transmission effect of the radiator with a copper bronze finish. On top of these coats of terra cotta enamel were applied two coats of copper bronze, the same as was applied previously, and the loss in the conducting capacity was shown to be about 26.5%. This is about the same results as was obtained in the first experiments with copper bronze.

In order to determine whether this loss in heat transmission was produced by the pigment of the paint or by the vehicle carrying this pigment, test No. 7 was made using only the vehicle, which was a light brown varnish. This test shows a loss of 2.8% as compared with the unpainted radiator. The same was true when a light oak brown varnish was used. This varnish was applied on top of the coats as previously mentioned. The varnish was followed by two coats of aluminum bronze, and the heat transmission was nearly the same as that shown by the copper bronze, namely a loss of 27%.

The interesting fact is that the transmission of heat was almost the same

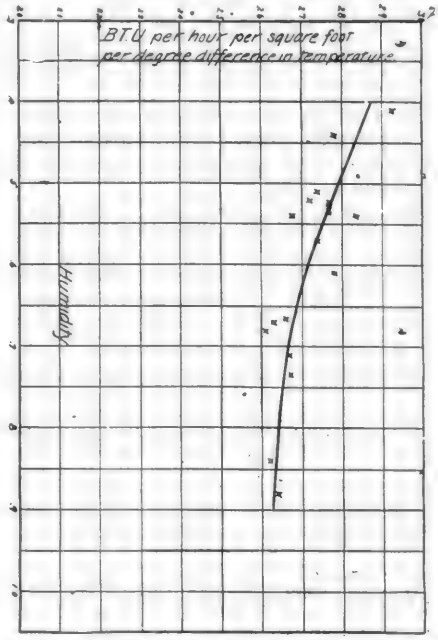


FIG. 1. CURVE SHOWING HEAT TRANSMISSION FROM RADIATORS AS AFFECTED BY HUMIDITY

with 14 coats of paint applied to the radiator as with two coats, and that the effect apparently depended upon the last coat applied and the intermediate coats through which this heat was transmitted had very little effect upon the heat transmission. That is, the heating effect of the radiator was more affected by the condition of the surface than by the material through which the heat was conducted.

Tests 10, 11, 12, 13, 14 and 15 were started with two coats of aluminum bronze. The heat transmission was practically the same as for the aluminum bronze in Test No. 9 in which twelve coats of other paints had been applied, showing, as previously stated, that the various coats underneath the last coat made very little difference in the heat transmission. These coats of aluminum bronze were followed by a

RADIATOR TESTS.

TABLE I.

No. of Test.	Steam Pressure.	Average room temp.	Average temp. of steam entering the radiator.	Difference in temp. between air and steam.	Condensation per hr. per sq. ft. actual surface.	B.T.U.'s rad. per hr. per sq. ft. of surface per deg. diff. of temp.	Condensation per hr. per sq. ft. actual surface.	B.T.U.'s rad. per hr. per sq. ft. of surface per deg. diff. in temp.	Efficiency.	Humidity.		REMARKS. Radiator No. 2 Plain in all tests.
1	2	3	4	5	6	7	8	9	10	11		
					RADIATOR NO. 1.		RADIATOR NO. 2.					
1	425	74.4	222	148.6	.413	2.82	.413	2.82	.997	.45	1	Radiator No. 1 Plain as received from factory
2	425	76.0	220	144.0	.418	2.94	.414	2.925	1.005	.408	2	" " " " " " "
3	425	63.1	224	156.3	.353	2.16	.438	2.835	.761	.542	3	" " " Painted with Copper Bronze
4	425	72.3	220	148.7	.325	2.08	.432	2.78	.752	.608	4	" " " " " " Terra Cotta Enamel
5	425	74.5	220	146.5	.436	2.86	.426	2.78	1.038	.437	5	" " " " " " Copper Bronze
6	425	66.3	218	149.7	.351	2.24	.478	3.05	.735	.482	6	" " " " " " Light Brown Varnish
7	425	74.1	224	150.9	.421	2.67	.442	2.74	.977	.510	7	" " " " " " Oak Brown Varnish
8	425	72.9	226	154.0	.431	2.67	.442	2.74	.977	.572	8	" " " " " " Aluminum Bronze
9	425	71.8	225	154.0	.318	1.97	.436	2.70	.730	.512	9	" " " " " " " "
10	425	70.5	224	154.4	.324	2.005	.448	2.77	.724	.525	10	" " " " " " Silver Gray Enamel
11	425	66.7	223	157.3	.442	2.68	.441	2.77	.970	.530	11	" " " " " " Snow White Enamel
12	425	67.6	224	157.4	.452	2.75	.446	2.72	1.01	.520	12	" " " " " " Bronze Green Enamel
13	425	64.2	224	160.5	.446	2.66	.448	2.67	.997	.708	13	" " " " " " No Lustre Green Enamel
14	425	64.0	224	161.0	.429	2.545	.447	2.67	.956	.735	14	" " " " " " Maroon Gloss Japan
15	425	70.6	224	154.4	.423	2.62	.423	2.63	.997	.670	15	" " " " " " Shellac and Copper Bronze Powder.
16	425	68.5	224	156.5	.364	2.22	.427	2.61	.850	.680	16	" " " " " " Copper Bronze Powder and Linseed Oil.
17	425	67.0	224	158.0	.347	2.02	.469	2.66	.760	.665	17	" " " " " " White Paint
18	425	86.9	224	138.1	.379	2.62	.381	2.66	.987	.848	18	" " " " " " Terra Cotta Paint
19	425	83.4	224	140.5	.389	2.65	.386	2.64	1.00	.88	19	" " " " " " Light Green Paint
20	425	86.8	224	138.0	.374	2.59	.378	2.62	.989	.84	20	" " " " " " " " " Zinc
21	425	77.2	224	147.8	.423	2.72	.418	2.72	1.00	.60	21	" " " " " " Terra Cotta Paint Zinc
22	425	77.7	224	146.3	.408	2.66	.422	2.77	.964	.535	22	" " " " " " White Paint Zinc
23	425	76.0	224	149.0	.418	2.70	.413	2.68	1.01	.540	23	

These paints of two coats each were painted over one another in the order given.

This Series follows one another.

Painted over one another.

series of enamels of different colors as stated in table. You will note, as shown in test No. 12, that the snow-white enamel gave the best results. The lowest result was given by "no lustre" green. The extreme difference due to color was about 5.4%.

Tests 16 and 17 were made using a different vehicle for carrying the pigment. You will notice in these tests that copper bronze and shellac seem to give better results than copper bronze and linseed oil, so that the vehicle may have some effect in the value of the heat transmission of paints. Tests 18, 19 and 20, made with white lead paints show that the transmission effect with white lead and oil is practically the same as for unpainted radiators. These white lead paints were followed by coats of zinc paint, as shown in tests 21, 22 and 23. For the light green and white the transmission effect was practically the same as for unpainted radiators. For terra cotta there was a slight reduction in heat transmission.

These tests covered a period of about three months. They seem to show that the poorest coverings are the copper and aluminum bronzes; the best materials tried were the enamels, while white lead paints and zinc paint are only slightly less in transmission effect than a coat of enamel.

EFFECT OF HUMIDITY

From columns 9 and 11 the curve shown in Fig. 1 has been plotted. This shows, as has been pointed out before in a previous paper, that the rate of transmission of heat varies with the humidity; that the higher the humidity, the lower the rate of transmission, the probable variation through ordinary ranges of humanity being about 10% in the coefficient of radiation.

*Examples of Wind Effects on Ventilation and Heating**

By H. W. Whitten

The effects of wind blowing against a building are manifold. The most apparent effect is the inleakage of air through crevices, particularly those about the movable windows and doors. In cold weather this inleakage becomes sensible or evident in the form of cold draughts which are often noticeable at a distance from the walls toward the interior.

The volume of this inleakage varies in proportion to the velocity of the wind, sizes of crevices, and means of egress of air from the building. It is also affected in a small degree by the pressure exerted by the expanded warmed air inside of the building. This pressure must be overcome before the outside air can enter. During the heating season this inleaking air, being of a lower temperature than that at which the air inside is desired to be, must be heated.

Both these phenomena are apparent and their effects are common knowledge. Recent investigations have shown, however, that the variation in the volume of inleakage due to variation of wind velocity is much greater than was generally believed.

The least apparent effect, and, in the writer's opinion the most important, is the out-flow of warmed air through crevices in the sheltered sides of buildings.

Windows and doors are constructed with the primary object of excluding draughts from outside, but are not so well adapted to prevent air currents escaping from the inside.

The wind strikes an obstruction, a building, is diverted from its natural course and is forced to pass by and over the obstruction. In doing this its speed is accelerated, the parted currents uniting at some distance beyond the building resuming their normal velocity.

This action produces an area of low pressure in the lee of the building which acts as a partial vacuum. This partial vacuum acts as a continuous

*Read before The American Society of Heating and Ventilating Engineers, at Indianapolis, July 16, 1909.

pump on the crevices in the lee sides. As the pressure of the inside warm air is naturally outward, the combination of this pressure with the partial vacuum outside produces a greater loss than is sustained on account of inleakage, i.. e., assuming aggregate amount of crevice on each side to be equal. This loss is greatly increased when other means than wall crevices are employed to admit outer air, such as cold air inlets for hot air furnaces, supply inlets for indirect or fan systems, etc.

It has been well said by a writer on this subject that "we are prone to notice only that which is evident to the senses." This outward flow of air is not attended by disagreeable draughts and, unless special means are taken to detect it, is not evident to the senses.

TYPICAL TESTS

A few typical tests made by the writer and others the past winter in this connection should be of interest.

The first test is of a school building, rectangular in shape, the ends of building facing north and south, having stairway windows only in these ends; east and west sides divided into school rooms, each having 5 windows 5 ft. wide by 9 ft. high, window sills on a level with tops of pupils' heads when seated; windows having usual clearance; rooms heated by a fan system designed to supply 1800 cu. ft. of air per hour per pupil with inlet velocity of 750 ft. per min.; wind northwest, velocity 14.5 to 15 miles per hour; outside temperature 33°. Room No. 5 situated on the east side of first floor building, one room removed from south end, showed an average rate of supply velocity of 817 ft. per min. and a vent velocity of 340 ft. per min. Inlet and outlet of same size. Inlet 8 ft. above floor, outlet at floor and both on opposite side of room from windows. This showed a loss of 457 ft. per minute. An air test of this room showed 10 parts of carbon dioxide in 10,000. This loss was practically all above the breathing line and frequent complaints of headaches among scholars occurred.

Other rooms on the east side of building showed as follows:

	Rate of supply.	Rate of vent.
1st floor, Room No. 3	760	410
1st floor, Room No. 6	753	396
2d floor, Room No. 13	690	315
West Side:		
1st floor, Room No. 7 (partly sheltered)	660	700
2d floor, Room No. 14 (exposed to strongest wind effect)	410	705

TEMPERATURE CONTROL IN USE IN THE BUILDING.

Average temperature East rooms at the breathing level....73°; at floor 70°.
Average temperature West rooms, breathing level....68°; at floor 58°.

A test of another school building with wind at 18 miles per hour and outside temperature 30°, building heated and ventilated by gravity indirect system, showed an average of 20% loss from the supply ducts in rooms on the windward side and an addition of 60% to the vent velocity.

Rooms on the leeward side of the building showed an addition of 30% to the supply velocity and a reduction of 62% of the vent velocity.

A school building having a few corridor windows on the north side, and school room windows on the east, south and west was tested with typical results, as follows: Wind, 20 miles per hour, direction northwest. Room No. 26 on east side of building, two movable windows, 7 ft. wide by 9 ft. high, one tight window 10 ft. wide by 9 ft. high, sills level with breathing level. Inlet 8 ft. from floor, 4 ft. from east wall, volume of air supply 2340 cu. ft. per min., volume of air passing out vent 1451 cu. ft. per min.

Room No. 28 south side of building, near east end, windows same as No. 26, volume of supply 1863 cu. ft. per minute, volume of air passing vent 1311 cu. ft. per min.

A test made by Mr. A. B. Franklin of Boston and the Massachusetts District Police on a school building some years ago is also interesting. Wind, 25 to 30 miles per hour, and blowing toward a majority of windows in the building.

Room No.	Air supply at inlet. cu. ft. per min.	Air vent. at outlet. cu. ft. per min.
11 (exposed)	1536	2367
12 "	1533	2307
13 "	1996	2838
14 "	2244	2990
15 (partly sheltered)	2200	2368
16 " "	760	805

20 (exposed)	1694	2391
21 (partly exposed)	2517	2777
22 " "	1609	2031
23 " "	2253	2762
24 " "	1389	1653
25 (partly sheltered)	2301	2288
30 " exposed)	1984	2394
31 (exposed)	568	1154
32 (partly sheltered)	1602	1773
Hall (sheltered)	7833	5786
35 (partly sheltered)	2153	2442
34 " "	1863	2148
36 (exposed)	933	1404

A high school building was recently tested by Prof. H. C. Anderson of Michigan University, there being some question as to whether the heating contractor had put in a competent apparatus (fan system). The supply seemed of sufficient quantity and temperature, but rooms on the exposed sides of the building could not be satisfactorily heated. After shutting down the fan the supply ducts were closed in the rooms on the exposed side of the building and, with all doors and windows closed, it was found that as much air was being removed from the vent ducts as the fan system was supposed to supply. During this test the outside wind was of moderate velocity.

The writer recently had occasion to examine the ventilating system of a hospital. The heating season was over and the fan was not in operation. Supply inlets were in inner walls and about 10 ft. from floor. Vents were about 12 in. from floor. Outside wind 6 to 7 miles per hour. Anemometer showed no movement of air at inlets. Window crevices showed some inleakage on exposed sides and outleakage on sheltered sides. Vents in rooms on exposed sides showed a normal outflow, but those in rooms on sheltered sides showed a reverse current into the rooms. An examination of the attic (which was quite large) showed that the vent ducts ended at the attic floor and were covered with ¼ in. mesh wire screens. There were a few windows in the attic and a ventilator about 4 ft. in diameter was placed on the roof. Very little air movement could be detected through the ventilator which was of the ordinary hood type. The vents from rooms on the exposed side showed an upward current into the attic, but those on the leeward side showed a corresponding downward flow. Average velocity in each case was about the same. Odors of drugs could be detected in rooms far remote from where such drugs were used. The wire screens covering attic vents leading to rooms on sheltered side of building were covered with a cobwebby sort of dust, while those covering vents from the opposite side of building were clean.

Tests of several buildings in which the leakage about outer openings had been standardized by means of a metal expansion joint showed an average difference between supply and vent flow of 10 to 15%, the greater part of this being due to difference in temperature of air at these points.

A Defense of the Warm Air Furnace

By Charles S. Prizer

At the meeting of the Federal Furnance League in Atlantic City an elaborate answer to the criticism usually leveled at warm air furnace heating was made in the address of the League's president, Charles S. Prizer. The principal points in his address will be found in the following abstract:

The situation in the field of residence heating, which furnishes a mission for our organization and provides scope for its activities, may be summarized as follows:

Healthful heating necessarily involves ventilation.

Any method of heating which does not provide for or is not accompanied by adequate ventilation is unwholesome and essentially unsound in principle.

There is but one practical method of healthfully heating a residence, and that is by pouring pure warm air into its apartments. This method is accomplished in a more practical manner and at a lower cost by the warm air

furnace system than by any other system in existence.

Direct steam or water heating is condemned by every competent heating and ventilating engineer, and by every physician who has given the matter even the most casual consideration, as being unsanitary and unwholesome, because houses heated by direct radiation cannot be properly ventilated.

To heat residences by indirect steam or water is so costly, both as to the expense of installation and as to that of maintenance, that *this healthful and proper method of heating* cannot be considered in connection with one house out of a thousand.

We are entering an era wherein hygienic considerations are assuming in public opinion that high position which their surpassing importance entitles them to occupy. As this hygienic awakening proceeds, intelligent people everywhere will insist on having their houses so constructed and heated as to provide for formal, adequate ventilation, until finally the ventilation of residences will become the vogue, and it will be considered a barbarous and uncivilized thing to construct a human habitation without providing for changing and renewing the air in it.

WHY FURNACE HEATING IS DISCREDITED

Furnace heating has been discredited in the past because of poor, unscientific, impractical installation and the extensive use of cheap, flimsy constructions. Furnace heating can be rehabilitated in public esteem by strictly first-class installation and the use of high-grade apparatus. Furnace heating of the highest grade accompanied by formal ventilation can be provided for a residence at as low a cost as that of the inferior, unsightly and unsanitary method of heating alone, without ventilation, by means of a direct radiation system. Residence heating can be captured for the warm air furnace system if the installers of furnaces can be taught to do their work aright and to use first-class furnaces of sufficient capacity.

I venture to quote the objections to warm air furnace heating as set forth in a pamphlet entitled, "Home Sanitation," published by a company engaged on a very large scale in the manufacture of heating apparatus and appliances, and to attempt to answer them:

OBJECTION NO. 1

That "the moisture of the air is exhausted by passing over a frequently overheated firebox."

Answer. — The "frequently overheated firebox" does not exist in a properly proportioned and properly installed warm air furnace plant, as the furnace has sufficient capacity to perform its functions without superheating the firebox or any other part of the apparatus. However, the atmosphere in a room heated by pouring into it air which has passed over very hot surfaces will show just as high a humidity as will be shown in another room heated by direct radiation, provided both rooms are unoccupied. If both rooms be occupied by a number of people, the room heated by direct radiation will show the greater relative humidity, but this is due to "moisture" deposited in the air from the lungs, respiratory passages and bodies of the occupants; and this additional moisture stays in the room heated because the air is not changed and renewed as is done in indirect heating.

The effect upon the relative humidity in a house of raising the temperature from zero or from any other temperature to 70° or to any other standard, is the same, no matter what method of heating is employed, provided the air is not in some manner charged with additional humidity after being heated.

It is much easier and more practicable to humidify the air in connection with a warm air furnace system than in connection with either a direct or indirect system of steam or water heating, and there are now on the market most excellent automatic devices for providing a proper standard of humidity in connection with furnace heating, while there are no devices procurable which perform the same office in connection with direct radiation heating. Indeed, it is practically very difficult to impart an increased degree of hu-

midity to apartments heated by direct radiation.

OBJECTION NO. 2

"Poisonous gases come from the contact of organic particles with the superheated firebox."

Answer.—The "organic particles" referred to in this subtle assertion must be contained in the cold air supplied to the furnace. In good furnace practice this air supply is the purest obtainable in the space immediately outside the house, and we deny that it breeds poisonous gases when heated.

OBJECTION NO. 3

That "sulphur escapes from the burning coal through the iron surface when overheated."

Answer.—With a proper furnace and properly installed plant the "iron surface" need not be overheated, but even if heated to 1,500° the sulphur will not escape through it into the air chamber, because, even if any gas or air can pass through the iron at that temperature, it would pass inward into the combustion chamber and not outward from the combustion chamber. In actual practice the objection referred to is never encountered because it has no existence.

OBJECTION NO. 4

"Cellar air is drawn through the house if the cold air box is for any reason closed."

Answer.—A properly constructed cold air duct is perfectly tight and cellar air cannot, under any circumstances, pass up through the furnace. However, it is far more healthful to use a cellar air supply in furnace heating than to heat a house by direct radiation, because the air in the cellar must be constantly renewed from outside or there would be no upflow of air through the furnace.

OBJECTION NO. 5

"Unwholesome gases which lie near the surface of the ground are drawn upward if the cold air box is open."

Answer.—So it appears that we get bad air from the cellar when the cold air duct is closed, and bad air from the outside when the cold air duct is open; hence, the only logical conclusion must be that it is extremely dangerous to heat a house by air taken from outside and that the only healthful system is to been duly tempered by the breaths of occupants and other agencies, carefully preventing its contamination by any admixture with air from the outside. If the air near the ground is not of good quality in certain localities, the competent heating contractor would take the air from a plane high enough above the surface to avoid the contaminated stratum.

OBJECTION NO. 6

"The dust from the cellar and the dust from the street."

Answer.—There is no correct way to heat a building except to take air from outside, warm it and pour it into the apartments. If this air is liable to contain dust or smoke it should be thoroughly cleaned, and there are a number of plans and devices which do most thoroughly clean the air of dust or smoke and which are in common use in many localities. To maintain a state of even tolerable freshness and purity, the air in a house must be renewed from the outside; there is no alternative.

OBJECTION NO. 7

"In a short time in the life of the firebox of the furnace, the cement of its seams becomes loosened, through warping, cracking or burning out, and dust and gases permeate the house."

Answer.—Properly constructed furnaces do not have any "seams," and they do not have any cement in their scientifically constructed joints. The joints of the best furnaces are thoroughly packed with asbestos gaskets or packing and are absolutely and permanently gas and dust proof.

To-day formal ventilation is not even considered in the planning of one house in a thousand, and where ventilation is secured it is usually an incidental feature involved in the method of heating the building.

In a few years no house will be considered complete unless the proper provision is made for insuring the constant freshness and purity of its atmosphere during the winter months.

PROPER FURNACE CONSTRUCTION

While the construction of furnaces is probably to-day on quite as scientific a basis as is the construction of boilers designed for heating houses, there is undoubtedly great room for improvement. The furnace manufacturer should determine definitely the proper scientific relation that should exist in his furnace between grate surface, heating surface and free air space, in order to attain the best results in actual practice. With properly arranged heating surfaces and draft travel there must be a definite relation between the three construction elements named which is scientifically correct. This relation is certainly ascertainable, and it must be embodied in the actual apparatus before any manufacturer can justly claim to have a warm air furnace constructed on principles which are strictly correct and logical.

METHODS OF PROMOTING THE FURNACE BUSINESS

A number of the prominent members of this organization are earnestly in favor of an extensive and costly advertising campaign for popularizing high-grade warm air furnace heating, using the magazines, periodicals and newspapers for exploiting the merits of the furnace system. In doing this they claim that we would be meeting and offsetting the advertising along similar lines which has apparently been quite successful in promoting the hot water and steam systems of heating.

But these advocates of an extensive advertising campaign fail, I fear, to analyze the situation to ascertain whether or not we would be benefited as much by such advertising as are the manufacturers of boilers and radiators by the advertising which they have been doing.

The leading advertisers of boilers and radiators do this advertising merely as a part, and an incidental part, of a most complete and comprehensive sales system; and they so cover the entire national field with their representatives and agents that they can reap the benefit of their advertising in every nook and corner of the United States. They are prepared to show any heating contractor in the country how to properly install his goods, and the heating contractors are usually glad to take their advice and install the heating plants in accordance with their directions.

With us the case is radically different. Let us suppose that our advertisement in the "Ladies' Domestic Courier" convinces Mr. Jones, of Smithburgh, that he ought to heat and ventilate his house with a first-class furnace system. Mr. Jones calls on one of the local furnace dealers of Smithburgh and explains his wants. In ninety-nine cases out of a hundred, as the situation exists at present, this local dealer does not have any proper conception of the meaning of a first-class warm air furnace heating and ventilating plant; and he thinks that ventilation is only a foolish, fanciful fad anyway; and besides if ventilation does amount to anything, Mr. Jones will have all the ventilation he needs without installing a formal ventilating system; and furthermore, the dealer doesn't know how to installa ventilating system and he doesn't care to learn how to do so, and as Mr. Jones does not actually know much about the matter either, the upshot of the business is that the local dealer puts in for Mr. Jones the same old, defective, inadequate, rickety furnace job that he is accustomed to install, and Mr. Jones is dissatisfied with the heating of his new house and he believes that that seductive furnace advertisement and the whole furnace business are frauds, and as for him, he will have his house heated with water as soon as he can afford it.

Let it be a special feature of our work to educate the retail furnace dealers of the country to an appreciation of the great advantages of first-class furnace heating and ventilating, until they are enthusiastic advocates of the good cause, and let us drill and train them in the proper method of installing such plants. Our proper field for work is among the customers of each member of this Federal Furnace League, and this work should take precedence over any other, because it is more important.

THE HEATING AND VENTILATING MAGAZINE

Vol. 6 September, 1909 No. 9

PUBLISHED MONTHLY AT
1123 BROADWAY, NEW YORK
BY THE
HEATING AND VENTILATING MAGAZINE CO.

President A. S. ARMAGNAC
Secretary and Treasurer, G. PETERSEN
The address of the officers is the address of this magazine.

A. S. ARMAGNAC, Editor — G. PETERSEN, Advertising Mgr.

European Representative:
AMERICAN PUBLICATION BUREAU, 46, Upingham Road, Leicester, England

Subscription, - - - - - $1.00 per year
Foreign countries, - - - - 1.50 " "
Back numbers, - - - - - 15 cents a copy

Copy for new advertisements should reach us by the first of each month in order to insure insertion in that month's issue.

SINCE the inception of the movement for establishing a standard rating for house heating boilers, it has always been clearly recognized that a wide acquiescence on the part of the manufacturers to any plan adopted would be essential for the movement's success. Those having the matter in charge, have been careful to take the manufacturers fully into their confidence during the progress of their deliberations. It was hardly to be expected, however, that a unanimous agreement would obtain among the boiler makers and we think it was generally felt that as the new standard rating become widely known, and, especially, if it were found to work well in actual practice, all makers of house heating boilers would eventually see the wisdom of conforming to the standard rating idea.

THIS being the situation, the policy just announced by an important boiler manufacturer is significant, especially as it comes as the result of a careful study of the widely published plan adopted by the American heating engineers' society, for rating boilers. Instead of establishing conditions for ascertaining the capacity of a boiler, the manufacturer in question proposes to begin at the other end by flatly guaranteeing his published ratings. This, in effect, it is claimed, would standardize the ratings for that particular type of boiler and would offer a basis upon which other makes of boilers could be correspondingly standardized. Following is the guarantee in full:

"The ratings given in the following tables are based upon direct radiation. If direct-indirect radiators are used, each foot of surface is equivalent to 1⅓ sq. ft. of direct radiators. If indirect radiators are used, each foot of surface is equivalent to 1½ sq. ft. of direct radiators. The radiation installed must be sufficient to maintain a temperature of 70° F. in zero weather.

"The steam boiler ratings are based on 2 lbs. pressure at the boiler. The hot water boiler ratings are based on the temperature of the water being 180° F. at the boiler.

"Under usual conditions an allowance for piping and factor of safety is considered equal to approximately 50% of net amount of direct radiators. To ascertain the size of boiler required add 50% to the net amount of direct radiators; i. e.: 600 square feet of direct radiators will require a 900 foot boiler.

"This method of computation, together with the foregoing conditions, will give the net amount of direct radiators which we guarantee each boiler to carry, providing the boiler is properly connected to a chimney flue having a good and sufficient draft and that all cellar piping is well covered."

MECHANICAL EQUIPMENT

The Engineer and the Modern Building

By William H. Bryan, M.E.

Editor's Note.—*The need of a general knowledge on the part of the heating and ventilating engineer of the various appliances that go to make up the mechanical equipment of a modern building is well illustrated in the accompanying article by Mr. William H. Bryan, recently published in* The Realty Record and Builder, *of St. Louis. The article is, in fact, a concise epitome of our reasons for introducing this new department to our readers.*

Of the many notable achievements which mark the twentieth century not the least interesting is the modern building. It is not so picturesque or epoch-making perhaps, as some of the other marvels of these days—the telephone or the wireless telegraph for example—but it is nevertheless worthy of our profound respect. Whether it be an office building, a hotel, store, factory, warehouse, hospital, auditorium, school or residence—it is sure to be admirably designed for its special and peculiar purpose.

The design and construction of such buildings often involve difficult problems—such for instance as space limitations, poor soil for foundations, exposure to severe weather conditions, etc. Among the ordinary questions are adaptability to special and often peculiar purposes, limited choice in structural material, and precaution against fire—both as to building and contents.

We admire the massive building; its proportions impress us; its dignity and its harmony please. For all these it is common to give credit to the architect, and we do well in acknowledging and admiring his achievements. We appreciate and praise his skill, his learning, his artistic taste, his masterly grasp of detail. To him belongs the general design, its adaptation to the special purposes which call it into being, the selection of materials, and their use in pleasing forms. For his faithfulness to the canons of good design and good taste the world applauds.

But in these latter days another specialist has come into this field, to work hand in hand with him—the engineer, who finds in building work a wide field of usefulness. Where indeed is there a greater opportunity for one who is skilled in adapting the forces and materials of nature to the uses of mankind?

The modern engineer is many sided. He achieves his greatest success as a specialist. For our present purpose, however, we need only consider the four most prominent divisions of engineering, civil, mining, mechanical and electrical. The newer classifications — hydraulic, sanitary, power, heating and ventilating, and structural, may all be considered sub-divisions of these.

The problems which interest the civil engineer are: the foundation, and the soil upon which it rests, the frame work—now usually of steel, the strength of materials, the loading and wind pressures, the sanitary engineering—the plumbing apparatus, drainage, etc. His also is the accurate placing of the building on its ground plot, the running of lines and levels, and the maintenance of the integrity of the structure, as to being plumb and level throughout. Of great magnitude and importance are the steel frame of the modern sky-scraper, and the roofs and galleries of auditoriums.

The mining engineer may busy him-

self with the tiles, clays, stones, bricks and cements forming the walls, floors, and fire proofing; the steel used in the frame, and in the fuels to be later consumed in the operation of the building.

The problems of the mechanical engineer relate to the design of the power plant, boilers, furnaces—preferably smokeless, chimneys, engines, pumps, elevators, heating and ventilation, air washing, pipe lines, water supply, the sprinkling system or other fire prevention apparatus, coal storage, the distribution and uses of power, and often refrigerating plants, hot and iced water, etc., also the generation and distribution of compressed air, or air removal by a vacuum system—sometimes both.

The electrical engineer finds his field in the power generating system, the lighting of the building, electric motors and fans, the wiring and lighting fixtures, telephones, signal and call systems, etc.

Many of these merge closely upon the lines separating the various divisions of the profession. For instance the generators for the power plant are often handled by the mechanical engineer; the water supply by the civil engineer; and the elevator—now usually electric—by the electrical engineer.

It may be interesting to consider briefly the uses in the modern building of steam, water, electricity, power, air, gas and refrigeration.

Steam is used primarily for heating, this being done in some cases by direct gravity plants, and in others by the exhaust from steam engines and pumps through which the steam is first passed. Often there are special uses for steam, such as heating water, cooking, drying, sterilizing water or clothing, etc., many of which are accomplished by exhaust steam. The engines drive dynamos for light and power, and sometimes—as in factories—drive lines of shafting serving machines of various kinds. Pumps feed boilers, circulate water on the upper floors, run elevators, serve sprinkling systems, etc. Often steam is used in air compressors.

Water is used in the steam boilers, and is circulated for drinking, lavatories, plumbing apparatus, and for janitor's uses, scrubbing, etc. Sometimes independent fire protection lines are run, on which high pressure is maintained. Often there are sprinkler heads kept closed by soft metallic links which melt as the temperature rises, discharging sprinkling streams in their immediate vicinity. Many buildings circulate hot water, and some provide cooled and purified water for drinking. In many buildings the elevators are hydraulic. In some water is circulated through steam or ammonia condensers.

Electricity is distributed primarily for lighting—either arc or incandescent or both—also for driving motors for various purposes, and for telegraph, telephone, signaling and messenger systems, and sometimes for heating and cooking.

The modern building requires much power, its plant often exceeding in capacity that of a large factory. Primarily there are the elevators, which in the earlier buildings were usually belt-driven from shafts. Later they were built with their own independent steam engines. Then the hydraulic elevator was introduced, driven at first by pressure from the city water mains, and later by an independent pumping system, using the same water over and over. The latest elevator installations are electric driven by direct connected motors. Power is needed for many other purposes, manufacturing, ventilating fans, moving stairways, refrigerating machines, air compressors, power pumps, cleaners, cash or package systems, etc.

There is great need for air, the largest volume being handled by fans or blowers for ventilation. The entire air contents of the building may be changed every 15 minutes or oftener. Air in smaller quantities but under higher pressure may be distributed for operating tube systems for cash or packages, special machines or tools, and for barbers, dentists, hair dressers, etc., and for cleaning. For the latter purpose, however, the system in which a vacuum is carried and the air drawn

in has proved preferable. Vacuum systems are also used in connection with heating apparatus, regulation, conveying shavings or other refuse etc.

Gas mains are generally installed—usually for lighting and cooking—and sometimes for heating, and for special purposes in the arts—and occasionally to drive gas engines.

Hotels, restaurants, and department stores often have their own refrigerating plants which cool drinking water, preserve meat and vegetables, cool vaults containing furs, and even make ice. In some places the plant is used in summer to cool the air.

The various types of buildings differ greatly in their requirements. The office building for instance is usually tall and occupies valuable ground. Its equipment must therefore be confined to the minimum of space. Its principal mechanical engineering problem is the elevator plant, which must be speedy, economical in operation and maintenance, and above all safe. The lighting, heating and ventilation are also of great importance, as is also the water supply, which must usually be repumped to serve the upper stories. In hotels the heating and lighting and ventilation are perhaps of primary importance, although here the refrigerating and compressed air plants also serve valuable purposes.

In factories the generation and distribution of power are prime considerations, heating and ventilating being next, and then lighting. Much skilled attention is given nowadays to the natural lighting of factories.

In warehouses the prime consideration is roominess, strength of floors, fire proof construction, and fire preventing apparatus, sprinklers, etc. Large elevators for heavy freight work are required, while the heating, ventilation and lighting problems are secondary. In some, cold storage would be provided.

In hospitals the heating, ventilation, air washing and lighting are the prime features, although the kitchen, water supply, refrigeration, cleaning, sterilization, etc., must have careful consideration.

In auditorium fire protection and general safety are of prime importance, although heating, ventilation and lighting should receive equal expert consideration.

In our modern school buildings safety and fire proof construction are the prime considerations, although heating, ventilation and air washing are also of interest and importance. All of these features have been worked out to a great degree of perfection.

Even our residences should and do receive the attention of the engineer. Their heating and ventilation are hardly less important than in other buildings, while the water supply, sanitary appliances, cleaning, as well as artistic and efficient illumination—both natural and artificial—are given due consideration.

The apparatus available to render this widely divergent service is of many types. It is the engineer's duty to select that which best meets all the local conditions. He must determine the type of boilers, setting, heating and ventilation, lighting, elevators, power and water service, etc. He must advise the owner whether he had best install his own lighting and power plant, or rent that service from the central station. Reasonable first costs, low operation and maintenance expense, and—above all—safety and reliability, must ever be uppermost in his mind.

Much might be said of many notable advancements made in late years along these lines. In all of this work the engineer is making his influence felt, and he may be counted upon to continue as a factor in the further development of the modern building.

Trade Notes

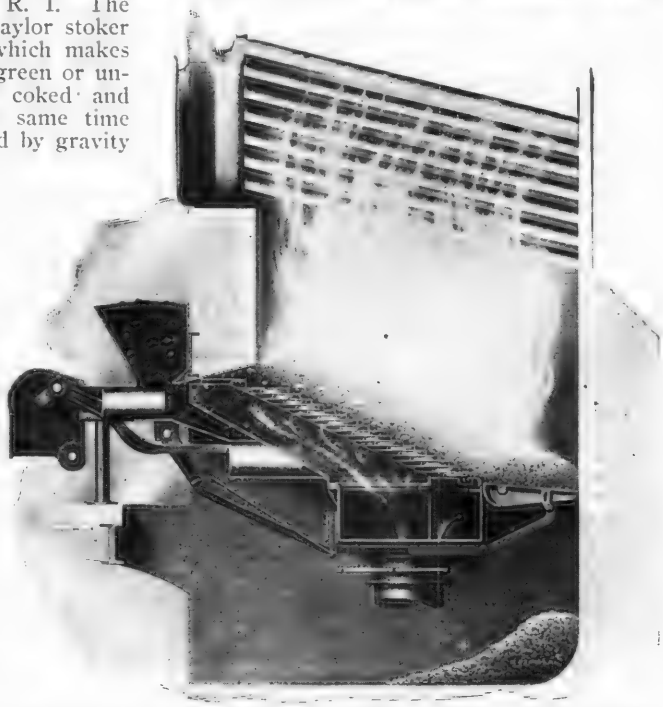
Electric Heating, a catalogue published by the Simplex Electric Heating Co., Cambridge, Mass., contains, in addition to a full line of electric heating appliances, some interesting types of electric radiators, including special designs for bath rooms, the latter ranging in capacity from 2,000 to 3,000 watts and made for 100-125 and 200-250 volts. The watt rating is based on 112 and 230 volts. Size 5½ x 8 ¼ in. Pp. 120. Another edition

of the same catalogue is published 3¼ x 5¼ in.

Taylor Gravity Under-Feed Stoker is the title of a handsomely illustrated catalogue published by the American Ship Windlass Co., Providence, R. I. The interesting feature of the Taylor stoker is its inclined under-feed which makes it the only stoker in which green or uncoked fuel is fed under coked and burning fuel, while at the same time the entire fuel bed is moved by gravity down an incline in such a manner as to rid itself of ash and clinker. Among the illustrations are elevations showing the application of the Taylor stoker to various types of water-tube boilers, while a separate view includes the blower equipment. Size 6 x 9 in. (standard). Pp. 40.

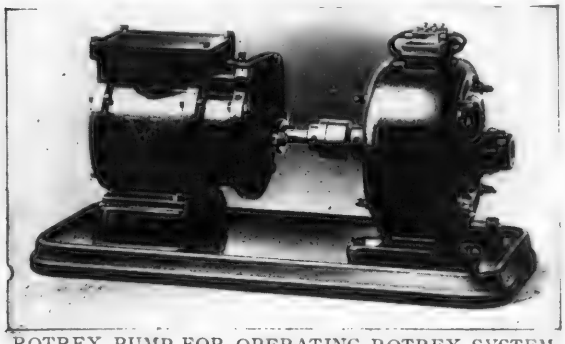
Sprague Electric Co., New York, includes among its publications, interesting catalogues on direct-current electric motors for operating ventilating fans and blowers; continuous current direct-driven generators for lighting and power; electric dynamometers for measuring and absorbing power of various types of engines, pumps, etc.; round type direct-current motors; together with an illustrated circular containing a description of the electrical equipment of the Hotel Gotham, New York. The circulars are all printed in sectional catalogue form, suitable for binding under one cover. Size 8 x 10½ in.

Rotrex System of Cleaning, sweeping, scrubbing and mopping, discharging the dirt direct to the sewer, designed for use in residences, is described in a well-designed catalogue, published by the Vacuum Engineering Co., 114 Liberty street, New York. The Rotrex pump as used in this system consists of a rotor within a cylinder, without sliding blades or other complicated parts. The rotor runs on two long brass bearings, which



APPLICATION OF TAYLOR GRAVITY UNDER-FEED STOKER TO WATER-TUBE BOILER

are the only real bearing parts. For larger equipments, the catalogue shows illustrations of the suction valveless reciprocating vacuum pump, which may be steam, belt or electrically driven. Size 6 x 9 in. (standard). Pp. 32.



ROTREX PUMP FOR OPERATING ROTREX SYSTEM OF VACUUM SWEEPING

Types of Vacuum Cleaner Plants, suitable for residences and small buildings are illustrated and described in a catalogue issued by the Vacuum Cleaner Co., 11 East 24th street, New York. The company also shows a standard plant for large buildings and announces that it is prepared to install large vacuum cleaner plants in all classes of buildings, which are described in Bulletin No. 151. Size 6 x 9 in. (standard). Pp. 8.

Fuller & Johnson Bilge Pump Outfits, with a capacity of 3,500 gals. per hour and operated by the Fuller & Johnson farm pump engine, are illustrated and described in a circular published by the makers, the Fuller & Johnson Mfg. Co., Madison, Wis.

Hills-McCanna Co., Chicago, Ill., publishes a comprehensive catalogue of vest-pocket size, covering its line of force feed lubricating pumps, with positive sight

feed, swing joints for bearings for oil or grease, also special high pressure gauge cocks and low water alarms. Each device is illustrated, the views including photographs of actual installations. Size 3½ in. x 6 in. (standard). Pp. 32.

Foos Gas and Gasoline Engines, manufactured by the Foos Gas Engine Co., Springfield, O., are the subject of an exhaustive and handsomely-printed catalogue. The types described include the Foos horizontal single cylinder engines in various combinations, also the Foos vertical heavy duty engines in two, three and four cylinder types, suitable for power plants from 20 HP. to 500 HP. and particularly for belted and direct connected electric installations. The catalogue also shows the Foos juniors in 2 HP. and 5 HP. sizes. Size 9 x 7¼ in. Pp. 56.

Steam Boilers and Steam Engines are the subjects of two comprehensive catalogues describing the product of the Brownell Co., Dayton, O. In addition to the many types of horizontal and vertical tubular boilers shown in the boiler catalogue, a number of pages are devoted to specifications for each type and to other useful information, such as heating surface and horse power of boilers, safe working pressures, steam tables, chimneys, circumference and areas of circles and rules for firemen. The engine catalogue takes up in detail the Brownell Twentieth Century engine as well as the Brownell heavy duty automatic engine and the Brownell heavy duty slide valve engine. Each catalogue is 9 x 6 in. Pp. 54 and 52, respectively.

Pop Safety and Relief Valves, pressure and vacuum gauges, manufactured by the Ashton Valve Co., Boston, Mass., are the subject of a comprehensive catalogue covering the company's output. Illustrations and full information of each device are given, together with a number of pages of useful information for the designing engineer. Size 6 x 9 in. (standard). Pp. 120.

Robb-Mumford Boilers, manufactured by the Robb-Mumford Boiler Co., South Framingham, Mass., are set forth in an interesting catalogue in whcih the evolution of this type of water-tube boiler is told, in the effort to combine the advantages of the Scotch and English types of internally fired boilers, with a lighter weight, less floor space and more perfect circulation than the best American boilers of the water-tube type. The views show various adaptations of the Bobb-Mumford boiler, as well as typical installations. Size 7 x 8 in. Pp. 40.

Garwood Electric Co., Garwood, N. J., announces that it has the exclusive right to manufacture and sell the dynamos, motors and other appliances formerly manufactured by the C. & C. Electric Co. The company further states that the C. & C. Electric Co. has discontinued the manufacture of electric apparatus. The C. & C. appliances, as described in recently-issued catalogue, include multipolar dynamos and motors, the "standard" dynamos and motors and several types of generating sets.

A New Pipe Joint Cement

Red and white lead and the ordinary pipe joint cements on the market are sold ready mixed with either water or oil, and as a result the customer in buying these cements pays a high price per pound for the water or oil, as well as for the cement proper. To obviate this disadvantage, the H. W. Johns-Manville Co., New York, has recently placed on the market what is known as H-O pipe joint cement. This cement is put up in powder form and can be kept in stock indefinitely, as it does not dry out or deteriorate. In using it, the cement is mixed with either water or linseed oil, making it ready for use.

Guaranteed Boiler Ratings

Gorton & Lidgerwood Co., 96 Liberty street, New York, manufacturer of the well-known Gorton side-feed boiler, announces the adoption of an important policy in connection with the ratings of its boilers. In a new catalogue which has just gone out to the trade, the company states its methods of arriving at the capacities of its boilers, and follows this with a definite guarantee that the boilers will perform the stated amount of work. Following is the form of guarantee in full:

"The ratings given in the following tables are based upon direct radiation. If direct-indirect radiators are used, each foot of surface is equivalent to 1⅓ ft. of direct radiators. If indirect radiators are used, each foot of surface is equivalent to 1½ ft. of direct radiators. The radiation installed must be sufficient to maintain a temperature of 70° in zero weather.

"The steam boiler ratings are based on 2 lbs. pressure at the boiler. The hot water boiler ratings are based on the temperature of the water being 180° at the boiler.

"Under usual conditions, an allowance for piping and factor of safety is considered equal approximately to 50% of net amount of direct radiators. To ascertain the size of boiler required, add 50% to the net amount of direct radiators; i. e., 600 sq. ft. of direct radiators will require a 900-ft. boiler.

"This method of consumption, together with the foregoing conditions, will give the net amount of direct radiators which we guarantee each boiler to carry, providing the boiler is properly connected to a chimney flue having a good and sufficient draft and that all cellar piping is well covered."

Methods of Piping Heaters and Receivers in Connection with Exhaust Steam Heating and Drying Systems

The arrangement of steam piping, especially exhaust steam piping, in connection with steam heating systems, is a subject upon which there has been much discussion and difference of opinion. Among the facts that have emerged, two are essential; first, the piping must be so large as not to create injurious back pressure, and, second, condensed steam and air are heavier than steam and will flow to the lowest part of a system naturally by gravity, provided that the flow is not obstructed by pockets or by long piping of small diameter; it is then an easy matter to arrange for the removal of the air from above the returned water.

Our purpose in this article is to take up only that part of the piping which is installed, usually in the basement of the building, in connection with the heater and receiver or other apparatus performing the functions of expansion and return tanks, oil separators, traps, feed water heater, etc.

An arrangement for a gravity return heating system in connection with a thoroughfare open heater, which is frequently installed and which has given good results, is shown in Fig. 1. Two difficulties encountered with this method of connection are, first, the heater cannot be opened for inspection or cleaning while the heating system continues in operation, and second, in order to provide sufficient separator capacity for the entire volume of exhaust steam, a larger heater than would be required merely for heating the boiler feed water is necessary.

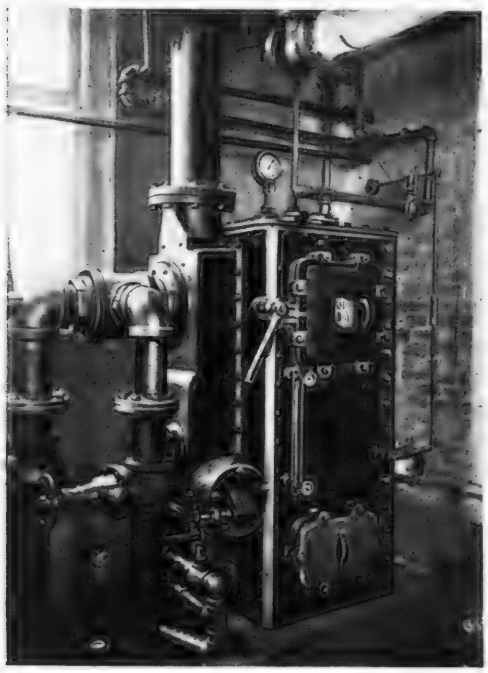


FIG. 1—ARRANGEMENT FOR A GRAVITY RETURN HEATING SYSTEM IN CONNECTION WITH A THOROUGHFARE OPEN HEATER

Both objections can be overcome by using a by-pass, but the by-pass arrangement illustrated in Fig. 2 is unsatisfactory because it does not provide for the removal of oil from the surplus exhaust steam passing to the heating system, and it is possible, by closing the valves in the two vertical pipes, to subject the heater to full boiler pressure, which in general the heater is not designed to wthstand.

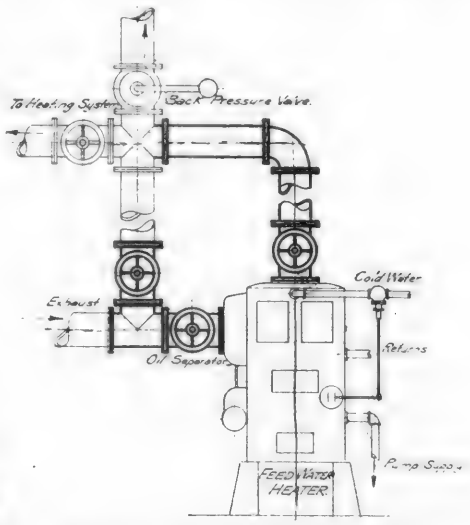


FIG. 2—COMMON BUT COSTLY METHOD OF BY-PASSING AN OPEN FEED WATER HEATER

In Fig. 3 this arrangement has been improved by the addition of an independent oil separator for protecting the heating system, while in Fig. 4 it has been simplified by the use of a preference tee, the object of which is to insure a supply of steam to the heater at all times, even when there is not sufficient for the heating system. It should be remarked that in both cases the independent oil separator should have sufficient capacity to purify the maximum volume of exhaust steam, as it will be called upon to do this when the heater is cut out of circuit or when the returns come back to the heater so hot that none of the steam is condensed. Fig. 5 shows a Cochrane steam-stack and cut-out valve heater, which is so arranged that the extra large

separator attached to the heater purifies all of the exhaust, including both what is consumed in heating the water and the surplus which goes to the heating system, while cut-out valves provide for cutting the body of the heater off from communication with the separator and

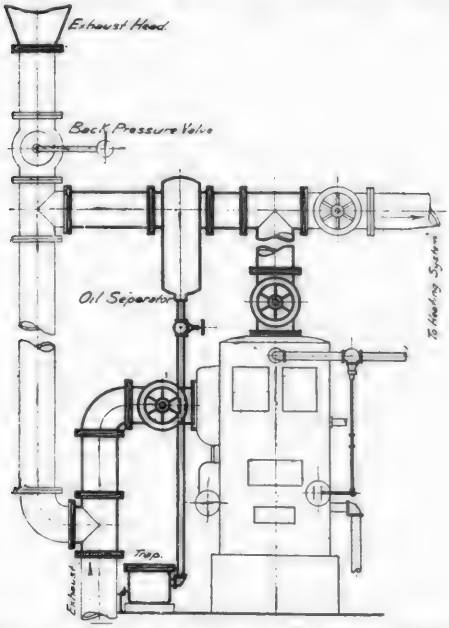


FIG. 3—FEED WATER HEATER EQUIPPED WITH INDEPENDENT OIL SEPARATOR

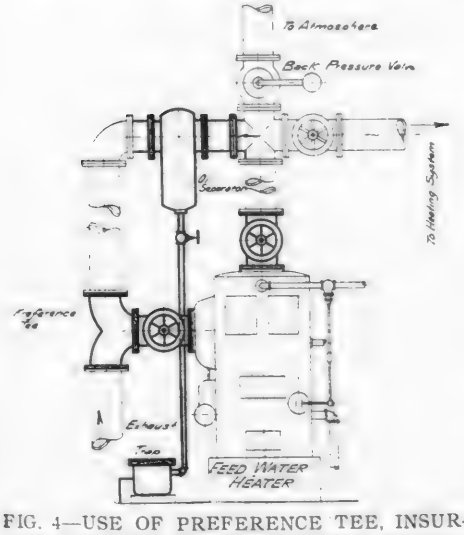


FIG. 4—USE OF PREFERENCE TEE, INSURING A SUPPLY OF STEAM TO FEED WATER HEATER AT ALL TIMES

trap when it is desired to clean the heater.

An arrangement in which an extraordinarily large separator is employed to perform the functions of a muffler tank, while the heating of the feed water takes place in a separate apparatus, is shown in Fig. 6. This arrangement is subject to the objection noted before of not purifying the exhaust steam when the main apparatus is cut out for cleaning, and, with the connection shown, it is also possible to throw full boiler pressure into the muffler tank by closing the two

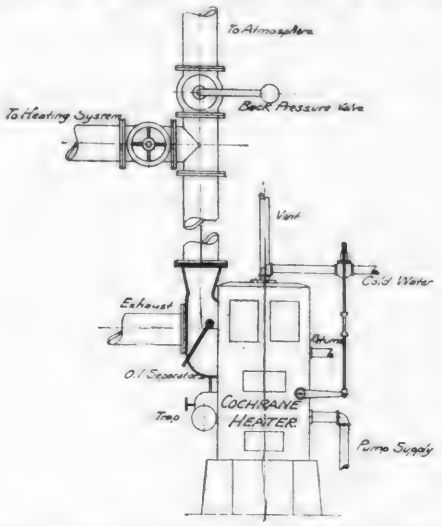


FIG. 5—COCHRANE TYPE OF STEAM-STACK AND VALVE HEATER

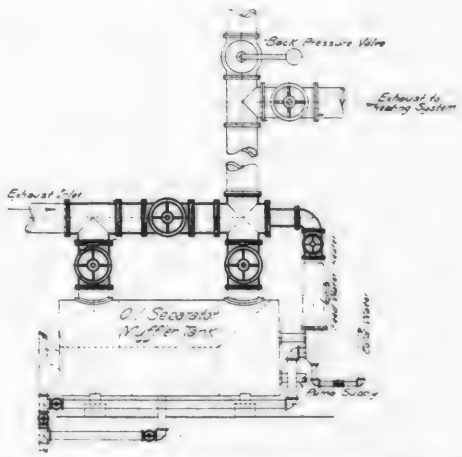


FIG. 6—USE OF LARGE SEPARATOR TO PERFORM FUNCTIONS OF MUFFLER TANK, WITH SEPARATE FEED WATER HEATING APPARATUS

valves. The apparatus does not provide for the skimming and filtering of the returns, nor for the automatic introduction of cold make-up water. The new Cochrane surplus exhaust feed water heater and receiver, shown in Fig. 5, performs all of the functions of the separate appliances and more, and as will be noted, occupies much less room.

Fig. 7 illustrates the application of a Cochrane steam-stack heater in connection with hot-blast heating systems, the

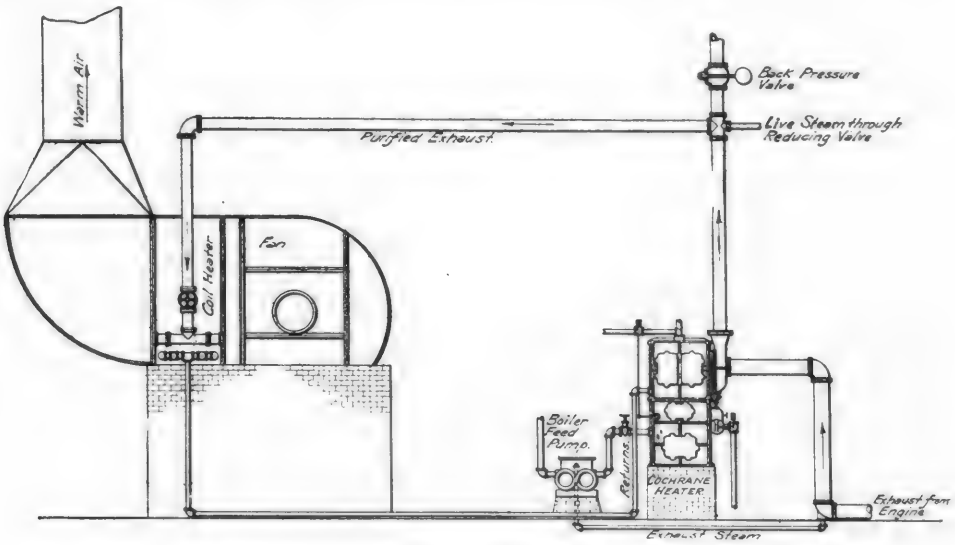


FIG. 7—APPLICATION OF COCHRANE STEAM-STACK HEATER IN CONNECTION WITH HOT BLAST HEATING SYSTEM

heater coil being treated as an ordinary radiator, so far as the circulation of steam is concerned.

Frequently it is necessary to install engine, exhaust steam heaters, piping, pumps, etc., in basements of office and other buildings where there is not sufficient headroom for the usual style of open heater. Sometimes the apparatus must be so located that in order to arrange for the connections to the heater and to the heating system and through the back pressure valve to atmosphere it is necessary to run the exhaust piping around sharp corners or to double back with it, which is an expensive undertaking when dealing with 12 in. or 16 in. piping. In order to meet these conditions a special type of the steam-stack and cut-out valve heater has been devised by the Harrison Safety Boiler Works, as illustrated in Fig. 8. It consists of a combination of the horizontal, cylindrical type of open heater and receiver with an extra large separator and steam stack.

Furman Sectional Boilers, made by the Herendeen Mfg. Co., Geneva, N. Y., are the subject of a newly-issued catalogue, containing illustrations of the newest types, designed to burn either hard or soft coal, wood and gas. Special attention is called to the extended heating surfaces in these boilers, the exceptionally long fire travel and deep fire pot. A new attachment is a cast-iron water back for the heating of water for domestic purposes. Pp. 20. Size 5¼ x 7¾ in.

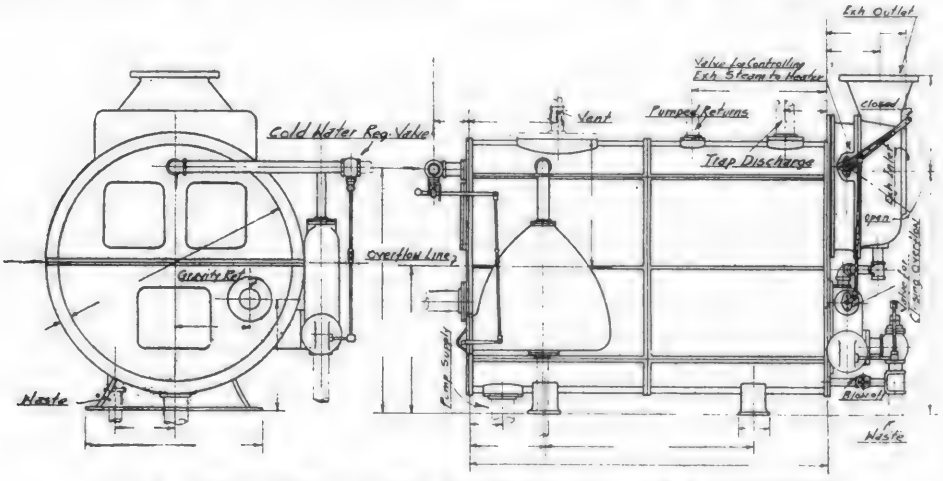


FIG. 8—TYPE OF FEED WATER HEATER DESIGNED FOR BASEMENTS WITH LOW HEADROOM

A New System of Temperature Regulation

The working of temperature regulators, as is well known, is based on the property possessed by a substance used in their construction of expanding under the influence of heat and reacting with very slight variations of temperature. This reaction effects the regulation of the temperature by means of more or less complicated apparatus.

The expansion of this material under the influence of heat is very slight. For this reason many different ways have been adopted to utilize this expansion to regulate the temperature. In order to construct a really sensitive temperature regulator, foreign sources of energy such as electricity, compressed air and hydraulic pressure have had to be employed. In such apparatus the expansion due to increase in temperature has merely started the action of the regulator, the valve being closed by an outside source of power.

The system described below was based on the idea of dispensing with any outside source of power and closing the valve by means of the superfluous energy contained in the heat in the heating material.

In this system, known as the Turul system, the idea is carried out in the following manner. The expansion of a thermostat fluid forces a few drops of a liquid with low boiling point into a closed chamber which is heated by the heating material. These drops vaporize in this chamber and the vapor thus formed is utilized to close the valve. Since the steam which closes the valve is raised by the heating materials, it is clear that the valve is closed by the heat contained in the heating system. The expansion of the thermostatic fluid only causes the vaporizing. In other words, it starts the regulator to work. The above describes the main characteristics of the Turul system.

The illustrations show a temperature regulator for low pressure steam heating installations, constructed according to this system. Fig. 1 represents the thermostat, and Fig. 2 the valve, in section. The pipe b (Fig. 1) connects the adjusting cap, cd, with the tube spirals a, and the pipe e leads from the latter to the valve cap, fg (Fig. 2). The latter consists of the fixed plate f and the thin copper membrane g. The adjusting cap, the tube b (Fig. 1), the spiral and the pipe e up to close to the valve-cap are filled with ether. The valve-cap and the end of the pipe e, which is soldered into the valve cap, are heated by the steam passing through the valve.

The adjusting cap is formed of the fixed bottom c and the membrane plate d. The latter is bent out of its place by the spring r and the knob q. The membrane can be pressed back, by turning the handle i, by means of the knob (Fig. 1).

As the membrane d is pressed more or less inwards, the ether in the pipe e is brought nearer to or farther from the valve cap. When the ether enters the hot end of the pipe, it immediately evaporates, and the ether vapor bends the membrane g outwards. The latter then presses the valve cone m onto its

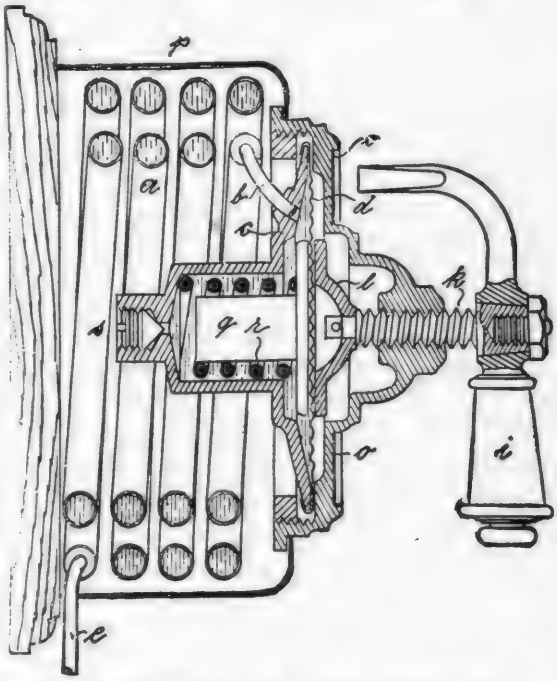


FIG. 1—THERMOSTAT OF TURUL SYSTEM OF TEMPERATURE REGULATION

seat and closes the valve. If the ether is drawn back the ether vapor follows it and comes into a cooler part of the pipe, where it again condenses. The spring n can then press back the membrane and the valve cone and the valve is again open.

The condensing plate h serves to receive and radiate the heat, which becomes free when the ether vapor condenses and forms a sharp division between the heated and cold parts of the pipe e.

On the adjusting plate o the temperature is marked in degrees from 0° to 23° C. The pointer is set to the required temperature and the valve then remains just open at this temperature. If the temperature of the room rises above the required height, the expansion of the ether in the thermostat forces the ether further into the pipe e, and the valve is closed exactly in the same way as

when the membrane d is pressed inwards. When the temperature is higher than the desired temperature, the valve remains closed until the temperature falls to that desired.

Since the volume of a liquid is enormously increased when it vaporises, the evaporation of a very few drops of ether suffices to shut the valve. The Turul temperature regulator is, therefore, extremely sensitive.

The membrane g which closes the valve is made of thin tinned copper and lasts an indefinite time, since its movement is extremely small. As a test a valve was suddenly opened and closed 5,000 times, without the plate showing any change.

The filling plugs and the membrane plates are securely soldered so that only a very small amount of ether can escape. Every apparatus is carefully tested before being despatched.

The thermostat is very small and of elegant shape. The nickel plated box p which contains the spiral tube is cube-shaped and only 100 mm. each way.

Up to the present only ½ in. and ¾ in. Turul temperature regulators for low pressure steam heating have been ready for delivery. The device is the invention of H. Segesváry, of Bremen, Germany.

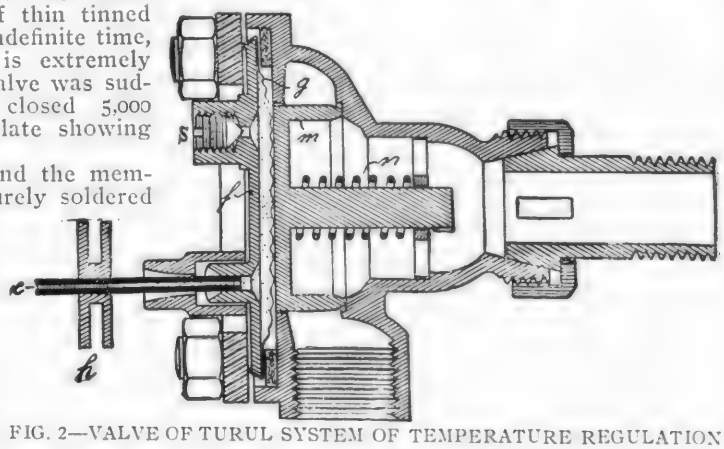


FIG. 2—VALVE OF TURUL SYSTEM OF TEMPERATURE REGULATION

The Weather for July

July, 1909, will be remembered as a cool and delightful month in many parts of the country, especially in the east. In no section from which reports were received was the mean temperature for the month above normal and in some cases it was from 2° to 4° below normal. The month was also notable for prolonged dry spells in many localities. In St. Louis, however, the rainfall was excessive.

NEW YORK

Highest temperature, 92° on the 30th; lowest temperature, 24° on the 8th; greatest daily range, 24° on the 8th; least daily range, 3° on the 23rd. Mean temperature for the month, 73°, 1° below the mean of this month for 39 years. Total rainfall, 1.98 in., nearly 2½ in. less than usual. Total wind movement, 7,922 miles, mostly from the south.

BOSTON

Highest temperature, 95°; lowest temperature, 53° on the 9th; greatest daily range, 27° on the 8th; least daily range, 8° on the 21st. Mean temperature for the month, 72°, corresponding to the mean of this month for 39 years. Total rainfall, 0.97 in., over 2½ in. less than usual. Total wind movement, 7,170 miles, mostly from the west.

PITTSBURG

Highest temperature, 81° on the 1st; lowest temperature, 50° on the 4th; greatest daily range, 28° on the 9th; least daily range, 10° on the 29th. Mean temperature for the month, 71°, 4° below the mean of this month for 39 years. Total rainfall, 1.22 in., over 3 in. less than usual. Total wind movement, 6,654 miles, mostly from the northwest.

CHICAGO

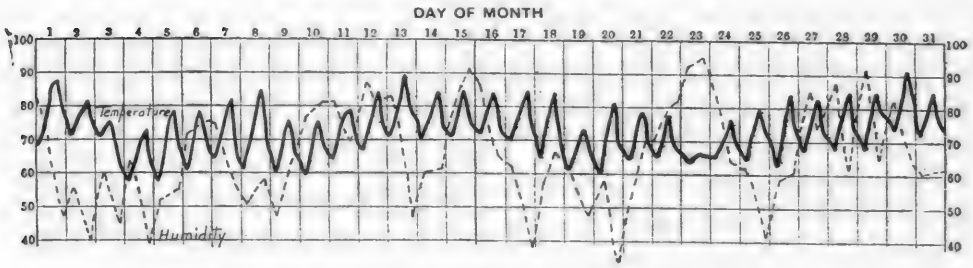
Highest temperature, 92° on the 29th; lowest temperature, 55° on the 3rd; greatest daily range, 22° on the 21st; least daily range, 5° on the 4th. Mean temperature for the month, 72°, corresponding to the mean of this month for 39 years. Total rainfall, 1.77 in., nearly 2 in. less than usual. Total wind movement, 8,756 miles, mostly from the northeast.

ST. LOUIS

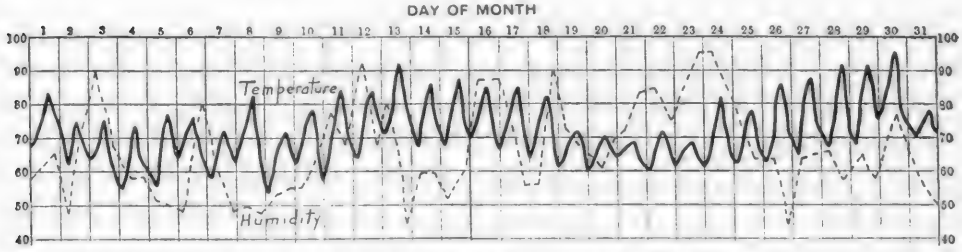
Highest temperature, 96° on the 2nd; lowest temperature, 57° on the 4th; greatest daily range, 24° on the 4th; least daily range, 7° on the 10th. Mean temperature for the month, 77°, 2° less than the mean of this month for 37 years. Total rainfall, 7.34 in., nearly 4 in. more than usual. Total wind movement, 6,484 miles, mostly from the southeast.

Automatic Ventilating Device

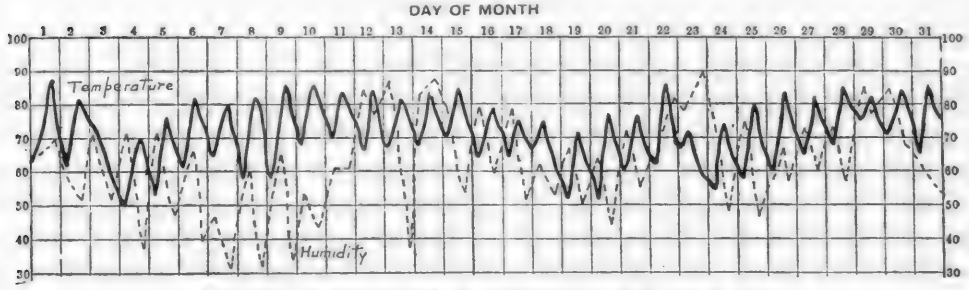
A novel but simple device for ventilating cars, factories and houses has just been devised by H. T. Minnitt. In a panel of glass or sheet metal a large number of bosses are stamped, each boss being perforated by a hole about a quarter of an inch in diameter. The panel is mounted in a wall or window and if the bosses project outward the wind causes a distinct current of air outward through the holes, but if the panel is reversed the current passes inward. The action is still the same whether the wind blows directly against the panel or across it.



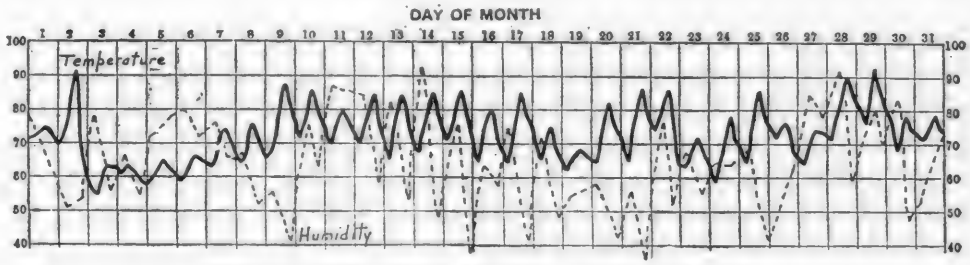
RECORD OF WEATHER IN NEW YORK FOR JULY, 1909



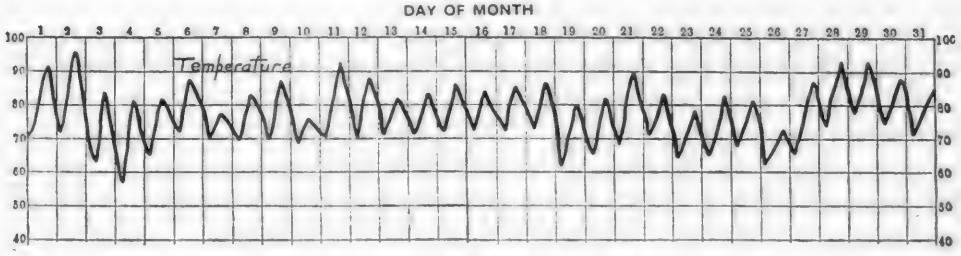
RECORD OF WEATHER IN BOSTON FOR JULY, 1909



RECORD OF WEATHER IN PITTSBURG FOR JULY, 1909



RECORD OF WEATHER IN CHICAGO FOR JULY, 1909



RECORD OF WEATHER IN ST. LOUIS FOR JULY, 1909

Current Heating and Ventilating Literature

POWER PLANTS

The Shop Power Plant. Charles L. Hubbard. Gives suggestions to guide in the selection of equipment. Ills. 5,000 w. Ir Age—July 15, 1909. 20c.

Power Plant of the Apthorp Apartment, New York. Plan and description of a plant for a 12-story, steel-cage building, which possesses special features of interest. 3,500 w. Eng Rec—July 17, 1909. 20c.

The Power Plant of the University of Alabama. F. H. Sibley. Illustrated description of plant furnishing light, heat and power. 1,500 w. Elec Wld—July 22, 1909. 20c.

SHOP HYGIENE

Dust Removal in the Grinding Trades. C. Johnston and S. R. Bennett. From 1908 report of the Chief Inspector of Factories and Workshops. Describes experiments undertaken with a view to devising means to prevent inhalation of dust. 2,800 w. Mech Engr—July 9, 1909. 40c.

VENTILATION

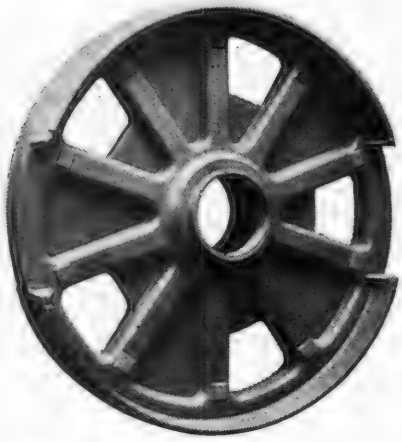
Ventilating a Twelve-Story Loft Building in New York. Illustrated description of a heating plant complying with the factory ventilating law. 4,500 w. Met. Work—July 10, 1909. 20c.

Niagara Boilers

In offering the new line of Niagara round sectional steam and water boilers the manufacturers lay stress first upon the clean surfaces in their construction. The entire bottom of the fire pot is grate with no shelf to accumulate ashes; the side walls slant slightly inward so as to readily free themselves; the crown sheet and bottoms of sections are practically self cleaning and all parts easily cleanable.

Ample fuel capacity is provided by a deep and nearly vertically walled fire pot which also gives ample combustion chamber, and, as this space is not encroached upon by pendent heating surfaces, the gases are thoroughly consumed. The openings in the crown sheet are such as to distribute the draft and yet leave enough solid crown sheet to capture all the heat and hold the gases in a hot place for the brief instant necessary for their combustion.

INTERIOR OF FIREPOT OF NEW NIAGARA BOILER



INTERMEDIATE SECTION OF NEW NIAGARA BOILER

NIAGARA STEAM BOILER

The crown sheet and the bottoms of the upper sections are equipped with arms radiating from the center designed to increase the heating surface and form

pockets in which the gases are deflected before passing upward. The sections are set staggered so that above every opening is a corresponding pocket to receive the impact of the gases and, in this way, the relatively short fire travel of a flat sectional boiler is made as effective as the longer travel through the unbroken flues of a vertical sectional boiler.

The side walls of the fire pot are deeply corrugated, thus materially increasing the heating surface and the metal is as light as consistent with sound castings and durability, so that the least possible metal is interposed between the water and the fire pot.

The sections are connected by cast-iron push nipples accurately milled, and held in place by a heavy tie rod inside of the boiler.

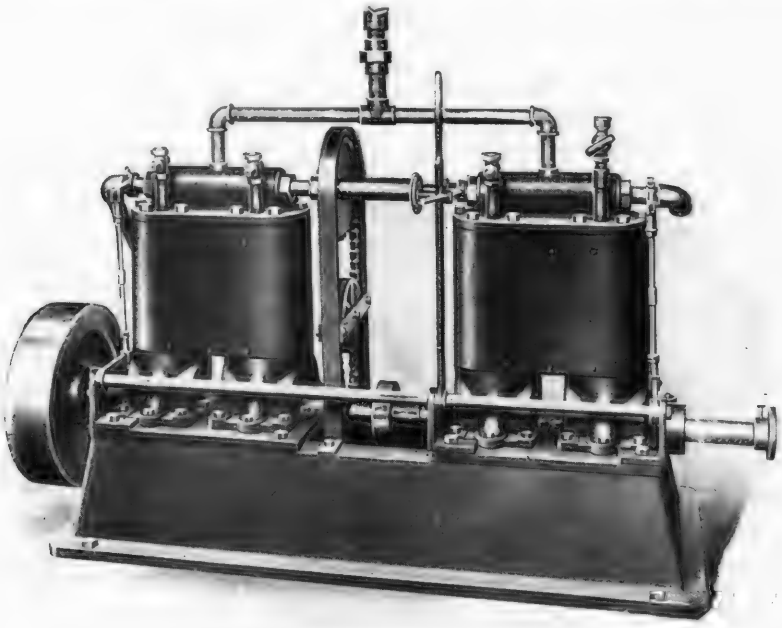
Before rating this boiler the manufacturers state that it was subjected to repeated and severe tests. This boiler is made in sizes ranging from 275 to 1,250 sq. ft. of steam radiation and from 450 to 2,100 sq. ft. of water radiation. A catalogue can be had on application to the manufacturers, The Niagara Radiator & Boiler Company, North Tonawanda, N. Y.

The New Rothchild Engine

A new type of stationary engine, placed on the market by the Rothchild Engine Co., 102 Centre street, New York, is attracting considerable interest on account of its novel construction. The officers of the company are: President, Charles H. Simmons; vice-president and secretary, Frederick Van Wyck; treasurer, Frank H. Simmons; secretary, Henry B. Van Wyck; mechanical superintendent, Joseph Rothchild.

The object of this invention is to furnish an engine that shall have the economy of the most perfect type of present stationary engine, simpler in construction and more convenient to operate than any engine of the reversible kind now in use. It differs from all other inventions of this kind by being more economical, simple and reversible at the same time.

The valves of this engine are located in the cylinder heads and are driven by a continuous rotary motion taken from the main shaft; the latter making three revolutions to one revolution of the valve. The valve is cylindrical in shape, and has three ports at equal distance on its circumference; thereby employing one port for each revolution of the main shaft. The port in the valve casing is equal in width to the blank space between any two ports on the cylindrical valve. It will be seen from this that the engine can obtain steam by moving in either direction.



THE NEW ROTHCHILD ENGINE

The forward and backward movement of the engine is controlled by the cut-off within the cylinder valve. The cut-off separates the live steam from the exhaust, and its port arrangements are such that they control, in the most economical way, both the admission and exhaust of steam, according to the load or speed required. The cut-off extends beyond the valve

casing far enough to permit the attachment of the controlling lever.

The cut-off may be moved or changed at pleasure—without detriment to the exhaust—to expose the port either for a forward or backward movement of the engine, depending upon which way the cut-off is tilted. The position of the cut-off also controls the amount of steam to be admitted to the piston. By this construction it will be observed that there is a continuous rotary valve movement between a stationary case and a cut-off which may be varied to suit the occasion or circumstances. This enables the valve to enter unimpaired steam at a positive point for the piston to receive same.

The variable cut-off inside of the cylindrical valve cuts off the supply of steam at any desired point of the stroke to suit the occasion, and may be operated by hand or governor. The sealing contacts of movements contained in the valve are self-sealing and arranged so as to take up their own wear by differential pressure.

This engine differs radically from all other cut-off engines in consequence of the continuous rotary movement of the valve, giving the latter a movement in one direction so that it can be met and regulated as to its steam admission with very slight movement of the cut-off, and this is only necessary when there is a change of load requiring a different amount of steam, or a change of direction requiring the reversing of the engine; otherwise the cut-off remains stationary.

The entire control of the engine as to starting, stopping, regulating or reversing is done by one simple lever conveniently located to the operator.

A Study of the Effect of Sulphur in Illuminating Gas on the Air in Rooms

Mr. Arthur D. Little, chemical expert and engineer, Boston, has recently completed an exhaustive series of experiments to determine the effect of sulphur in illuminating gas upon the air in rooms. In an ordinary dwelling house a single room was set apart for the experiments and apparatus was provided to determine the amount of gas burned within the room, the amount of sulphur originally contained in the gas, the amount of sulphur present in the air of the room, its rate of disappearance and its effect upon objects and human beings. The occasion of these tests was primarily to determine whether a reasonable amount of sulphur in excess of 20 grains per 100 cu. ft., which is the present Massachusetts limit, would prove in any way objectionable. It was shown that under the existing limitations a special hardship was imposed upon the gas producer because of the increasing difficulty of securing coal so low in sulphur as to make possible the manufacture of gas containing not over 20 grains of sulphur to the 100 cu. ft.

The report shows that sulphur gases formed on the combustion of illuminating gas are removed from the air of rooms in three ways: by the changing air in the ordinary course of ventilation, by condensation along with water vapors on the cold walls and windows, and through absorption by the alkaline constituents of the walls and ceilings. It was very clearly demonstrated that, other conditions being the same, it is only within narrow limits that an increase in the amount of sulphur in the gas or of the rate at which gas is burned causes a relative increase in the sulphur to be found in the atmosphere of the room. When the sulphur present in this atmosphere increases markedly the more rapid is the reaction between the plaster of the walls and ceilings and the sulphur gases.

That is to say, the plaster takes up the sulphur gases with greater rapidity. Calculation, however, shows that the plaster of an ordinary ceiling would serve to absorb sulphur gases from 20 grains gas burning 25 cu. ft. per day during the probable existence of a house. It is, therefore, evident that in the ordinary dwelling the plaster serves automatically to prevent a material increase of the sulphur in the air, even though there be a great increase in that contained in the gas. The relation of this fact to the hygienic conditions must be manifest. In fact, it was shown that the outside atmosphere contained at times one-third to one-fourth as much sulphur as may be found in an ordinary gas lighted room. In a well ventilated room with one or more occupants it was shown that the lighting of the gas would cause such a small rise in the sulphur present as to in no way become manifest to the senses. In fact, it was shown that the sulphur would have to be increased many times that of the ordinary room before the senses would be able to detect it.

It was determined as regards the vitiation of air by carbonic acid that one man had about the same effect as gas burning at the rate of 5 cu. ft. per hour. Even when the ventilation in a room was restricted as much as possible, the air changed 1.8 times per hour by diffusion through the plaster and walls. When the ventilation was rendered favorable for regular living conditions, the rate of change of air was several times greater than the figure just given. The influence of such rapid changes of air in a room in augmenting the absorptive effect of the plaster in preventing a high sulphur content is apparent.

The study of humidity conditions made it evident that but little condensation of moisture would take place on the surfaces of articles in the room, and hence that there would be little or no formation of sulphurous or sulphuric acid, or of injury which might result from the presence of such acids.

TRADE AND MISCELLANEOUS NOTES

Deaths

Roderick Perry Curtis, president of the Curtis & Curtis Co., Bridgeport, Conn., manufacturer of pipe threading machinery, died August 9 at Southport, Conn. Mr. Curtis's death was due to an automobile accident, which caused a blood clot on the brain. He was 49 years old. He became associated with William D. Forbes in 1882 in the manufacture of the Forbes patent die stock, the firm name being Forbes & Curtis. Mr. Forbes's interest was later purchased by Lewis B. Curtis. Mr. Curtis is survived by a widow and three children.

Max J. Mulhall, manager of the boiler department of the Thatcher Furnace Co., having been associated with that firm since 1897, died July 30, at Newport, R. I., of appendicitis. Mr. Mulhall was widely known in the heating trade and was a member of the heating engineer's society.

Cornelius Kendall, vice-president and general manager of the Shaw-Kendall Engineering Co., Toledo, O., died August 15 in his 70th year. Mr. Kendall began his busines career in Chicago but spent the greater part of his life in Toledo, being well known in connection with the commercial interests of that city.

Miscellaneous Notes

Clarence M. Woolley, president of the American Radiator Co., is home from a European trip.

Lewiston, Idaho.—A proposed ordinance is before the city council granting a franchise for the operation of a central heating plant in Lewiston, to cost $55,000. P. A. Williams is among those interested.

Clintonville, Wis.—A committee of aldermen has reported favorably on the proposition of installing a central heating system for the school buildings of Clinton, connected to the local electric light station, thus utilizing the exhaust steam of that plant.

North Yakima, Wash.—The Central Heating Co., which was recently granted a franchise to supply steam heat in North

ENGINEERS AND STEAMFITTERS REQUIRE GOOD TOOLS

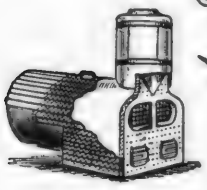
The GENUINE ARMSTRONG Stocks and Dies are

RELIABLE, ACCURATE, EASY WORKING

MANUFACTURED BY

THE ARMSTRONG MFG. CO., 321 Knowlton St., BRIDGEPORT, CONN.

TELEPHONE CALL 6007 FRANKLIN.



ROBERT A. KEASBEY CO.

HEAT AND COLD INSULATING MATERIALS

HEADQUARTERS FOR
85% MAGNESIA, ASBESTOS AND BRINE
PIPE COVERINGS, ASBESTOS PRODUCTS, ETC.

ESTIMATES FURNISHED AND CONTRACTS EXECUTED.

100 NORTH MOORE ST, NEW YORK CITY.

Yakima, has let the contract for the installation of its plant to the Schott Engineering Co., Chicago, for $62,000. The Central Heating Co. is made up of local capitalists, including H. B. Scudder, Alexander Miller, J. L. Hughes, A. E. Larson and O. A. Fechter.

Webster, Ia.—The city council has passed an ordinance placing the price of steam heat at 32½c. per sq. ft. of radiation, which is a raise from 25c., the price charged heretofore.

Association of Board of Education Designing Engineers is the name of a new organization, whose objects are stated to be "the promotion of the design and installation of mechanical, heating and ventilating, electrical and sanitary engineering in connection with the public schools," etc. At a meeting held in New York, the following officers were elected: President, James H. Brady, Kansas City, Mo.; secretary and treasurer, Daniel A. Casey, Boston. Those who attended the meeting and became charter members, included S. A. Thomas, chief of the electrical division Department of Education, New York; J. H. Lindsey, assistant heating engineer, New York; John H. Barbee, sanitary engineer, St. Louis; W. H. Dewar, plumbing inspector, New York; Claude A. Bulkeley, chief engineer, Board of Education, St. Louis; James H. Brady, chief engineer, Board of Education, Kansas City, Mo.; W. P. O'Toole, sanitary engineer, Boston; C. F. Eveleth, heating engineer, Boston; B. B. Hatch, electrical engineer, Boston; Frank G. McCann, heating engineer, New York. In speaking of the new organization, Mr. McCann stated that one of its principal functions will be in the line of developing a more uniform parctice in heating and ventilating work in public school buildings through an interchange of plans and specifications among the engineering departments of the various school boards.

Dayton, O.—The Dayton Citizen's Lighting Company has been granted the right to make extensions of their hot water and steam heating system in several streets of Dayton, in order to connect with the new Beaver power building soon to be erected.

Building operations for July show a continued net increase over those of the corresponding period a year ago. The eastern cities led with an increase of 39%; middle west, 22%; western cities, a decrease of 8%; southern, decrease of 11%.

Manufacturers' Publicity Corporation, Hudson Terminal Buildings, 30 Church street, New York, is the title of an organization composed of Benjamin R. Western and W. Hull Western, until recently proprietor and manager, respectively, of the Manufacturers' Advertising Bureau, New York, and Walter Mueller and W. H. Denney, late president and treasurer, respectively, of the Banning Co., also of New York. The officers of the new corporation are: President, Benjamin R. Western; vice-president and general manager, Walter Mueller; treasurer, W. H. Denney; secretary, W. Hull Western. The advertising interests of the clients heretofore directed by the aforementioned will hereafter be in charge of the Manufacturers' Publicity Corporation.

Building Trade Employers' Association, New York, has published a hand-book giving a list of exhibits in the permanent exhibition of high grade building and materials and appliances which is conducted by the assocation in the Builders' Exchange, 30-34 West 33rd street, New York. The exhibition is in charge of James J. Conor, and was opened March 31, 1909. Eighty-five exhibits are now on view at the Exchange.

Manufacturers' Notes

Cameron-Schroth-Cameron Co., Chicago, Ill., wholesale dealers in heating and plumbing supplies, has leased a six-story and basement building facing Rush street, Michigan avenue and North Water street, containing a total floor area of 76,000 sq. ft. at a rental of $161,250. Extensive improvements will be made.

Mathis Bros., Chicago, Ill., manufactures of heating and ventilating apparatus under the name of the New York Blower Co., announce the removal of their manufacturing plant at Bucyrus, O., to Laporte, Ind. The plant employs 200 men.

Stanley G. Flagg & Co., Philadelphia, Pa., announce the improvement and enlargement of their foundry plant at Stowe, Pottstown, Pa., to which their manufacturing department will be moved. This will result in the closing of the Philadelphia foundry.

DIXON'S PIPE - JOINT COMPOUND

for all threaded or flanged connections. Makes tight joints, but never sets. Write for booklet and free sample 211 - D

JOSEPH DIXON CRUCIBLE COMPANY

JERSEY CITY, N. J.

American Radiator Co., Chicago, has declared the regular quarterly dividend of 1¾% on the preferred stock and 1½% on the common stock.

H. W. Johns-Manville Co., manufacturer of insulating materials, with branches throughout the country, is enlarging its Milwaukee plant to accommodate its hair felt manufacturing department, which is to be moved from Pittsburg to Milwaukee. Two six-story buildings 150 x 150 ft. and 50 x 150 ft., respectively, are being erected on Second street to replace the building recently burned. A 300 x 150 ft. three-story addition to the Menominee Valley (Wis.) works of the company is also being built. The additional accommodations will make room for an increase of from 300 to 400 employees.

Beaton & Corbin Mfg. Co., Southington, Conn., has completed an addition to its plating department. The company, which manufactures floor and ceiling plates, is introducing a new type of damper for ventilating work which is attracting considerable attention.

United States Steel Corporation announces an appropriation of $2,000,000 to cover additions and extensions to the tube plant operated by the National Tube Co., at Lorain, O. This action is interpreted as a decision on the part of the Steel Corporation to maintain its control of the pipe business in view of the threatened invasion of the pipe field by the Haselton Tube Co., Haselton, O., which is controlled by the Republic Iron & Steel Co.

Harry S. Martin has resigned as vice-president and general sales manager of the United States Radiator Co., Dunkirk, N. Y. Mr. Martin has been actively identified with the company for many years and is widely known in the heating trade.

David Williams Co., New York, publishers of *The Iron Age*, *The Metal Worker* and *Carpentry and Building*, and also publishers of technical books, has sold its entire business, including its trade publications, to the Root Newspaper Association. The purchase price is reported to be $1,500,000.

Consolidated Engineering Co., Chicago, has secured the exclusive rights to manufacture, use and sell all of the Thermograde Valve Co.'s appliances in the United States west and south of Altoona, Pa., and Baltimore, Md.

New Corporations

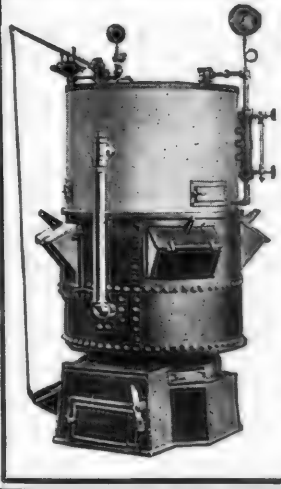
Harrison Engineering Co., 11 East 24th street, New York, capital $500,000, to manufacture heating and ventilating apparatus and to carry on an engineering business. Incorporators: P. B. Gibson, 146 West 64th street, and H. E. Harris, 20 West 98th street, and B. S. Harrison, 11 East 24th street, all of New York.

Gas Range & Heater Co., So. Pasadena, Cal. Capital stock, $50,000. Incorporators: G. W. Lawyer, G. H. Miner, T. Lowe, O. W. Orcutt and N. H. Campbell.

T. T. Connolly Co., Boston, Mass., capital, $10,000, heating, plumbing and hardware contractors. President, T. T. Connolly; treasurer, John H. Connolly.

J. V. Vrooman's Sons, Schenectady, N. Y., capital, $30,000, heating and plumbing contractors and hardware dealers. Incorporators: Edward S. Vrooman, William C. Vrooman, Edward A. Vrooman and William Sink.

Home Electric & Heating Co., Eveleth, Minn. Capital stock, $750,000. Incorporators: H. W. Irwin, Thomas Lee and H. E. Griswold.



Guaranteed BOILER RATINGS

WE have issued a new price list giving the guaranteed ratings of the GORTON SIDE-FEED BOILERS which we will stand back of.

Copy with new discounts will be mailed on application.

GORTON & LIDGERWOOD COMPANY
96 Liberty Street NEW YORK

H. D. Fitzgerald Co., Bridgeport, Conn., capital stock $10,000, to conduct a heating, plumbing and roofing business. Incorporators: H. D. Fitzgerald, H. J. Donahue and Edward Nicholson.

Engineers' Specialty Co., Kansas City, Mo., capital $100,000, to manufacture specialties for engines and boilers. Incorporators: J. George Brinkman, Great Bend, Kan.; Charles A. Thompson, Hutchinson, Kan.; Harry A. Ruggles, James Armstrong and Edward A Menozer, Kansas City, Mo.

Krekel Bros., White Plains, N. Y., capital $25,000, to manufacture stoves, ranges, heaters, boilers, etc. Incorporators: Charles L. Krekel, Henry W. Krekel and Herman Berje.

John Curtin Plumbing & Heating Co., East Orange, N. J. Capital stock, $50,000. Incorporators: Harry A. Picking, David A. McBride and Leslie Gray.

Osborne, Rea & Co., New York, capital $10,000, to manufacture heating and ventilating apparatus. Among those interested are Charles T. Osborne, Charles R. Wight and Daniel R. Rea.

Spencer Plumbing Co., New York, Capital stock, $10,000. Incorporators: Harry Spencer, Mary A. Spencer and J. Cohen.

Carlinville Light, Heat, Ice & Power Co., Canton, Ill.

Continental Radiator & Foundry Co., St. Louis, Mo. Capital stock, $50,000. Incorporators: L. F. Ostrander and others.

Dobson Plumbing & Heating Co., New Brunswick, N. J. Capital stock, $20,000. Incorporators: Thomas J. Dobson, Alvah A. Hastings and Maude S. Hastings.

Syracuse Die Molded Casting Co., Syracuse, N. Y., capital $10,000, to manufacture finished castings.

Maynard-Crutchfield, Co., Winston-Salem, N. C., capital $25,000, to conduct a heating and plumbing business. Incorporators: F. G. Crutchfield, T. P. Maynard and A. F. Jones.

Niles Heater & Mfg. Co., Sioux Falls, S. D. Capital stock, $750,000.

Robinson Furnace Co., Chicago, capital $30,000 to manufacture heating apparatus. Incorporators: Edward H. Robinson, Frank E. Robinson and J. E. Pierson.

Morgan Vacuum Valve Co., Rochester, N. Y., capital $75,000, to manufacture heating specialties. Incorporators: John B. Morgan, Josephus Albee and George G. Ford, all of Rochester.

Boulevard Plumbing & Heating Co., Cleveland, O., has been established on Superior Avenue by R. Hawkins and T. Aitchison, who have purchased the business formerly conducted by T. McGrath.

Cool Weather in Summertime

You can have cool weather in summertime with the Webster Air Washer.

Without recourse to refrigeration the air temperature in buildings can be reduced materially by the use of running water, and the air will be pure and free from dirt or odors.

Let us tell you more about it.

Booklet 17-A is Free

WARREN WEBSTER & CO.

CAMDEN, N. J.

Air Cleansing **Air Cooling**
Automatic Humidity Control

Established 1888. Branches in the Principal Cities

W. G. Cornell Co., 1123 Broadway, New York, is a new firm of steam fitting contractors. President, W. G. Cornell; secretary and treasurer, George W. Simmons, both of whom were formerly connected with Wells & Newton Co., New York.

Northwestern Radiator Co., Sauk Center, Minn.; capital, $60,000; to manufacture boilers, radiators and sash weights. A new plant, 40x80 ft., will be occupied in February. President, J. F. Cooper; vice-president, W. S. Dean; secretary, O. H. Schleusener; treasurer, C. A. Emerson.

Smokeless Heat & Power Co., Hollenden Arcade, Cleveland, O.; capital, $500,000; to manufacture an apparatus for the conversion of crude or fuel oil into heat and power. Incorporators: James W. Keenan and others.

Trade Literature

"How Is It Heated?" is the title of a folder being sent out by the American Radiator Co., Chicago, Ill., containing reproductions from newspaper clippings, showing how real estate "for sale" advertisements are now calling special attention to the types of heating plants with which they are equipped. The enterprise shown by the American Radiator Company is encouraging this style of advertising on the part of owners of buildings cannot fail to benefit the steam and hot water fitting trade, as well as calling tention to the adaptability, under widely varying conditions, of American radiators and Ideal boilers.

Green Patent Waste Heat Air Heater, manufactured by the Green Fuel Economizer Co., Matteawan, N. Y., and designed to heat air to be used for drying purposes, for heating buildings or for the supply of furnaces, is the subject of a 16-page pamphlet which the company is now distributing. This interesting apparatus was described in the August issue of this magazine.

United States Radiator Co., Dunkirk, N. Y., is sending out a catalogue in which is announced the manufacture of a new house heating boiler, known as the "Triton." This new line of boilers is made with grates ranging from 16 to 34 in., and are rated to carry 250 to 1,720 sq. ft. of direct steam and 420 to 2,870 sq. ft. of direct water radiation.

Contracts Awarded

Alabama Supply Co., Birmingham, Ala., steam heating Martin School, Birmingham, for $7,800.

Majestic Furnace & Foundry Co., Huntington, Ind., ventilating remodeled high school building, Huntington, for $5,225.

Indiana Engineering Co., Indianapolis, Ind., heating State Reformatory for $7,800. The Simonds vacuum valves will be installed. This is the result of a second advertising for bids.

R. Haas Electric Co., Springfield, Ill., heating, ventilating and plumbing, also electrical work in the Naval Training Station at North Chicago.

Fitzpatrick & Hoepfner, Columbus, O., steam heating plant for the Girls' Industrial Home, near Delaware.

Lewis & Kitchen, Chicago, steam blast heating and ventilating system for the high school building in Greenfield, Ind., for $7,288.

J-M CONDUIT vs. Ordinary Conduit

When steam is carried underground through wood, brick or cement conduit, about 50 per cent of the heat value of the coal consumed is wasted by radiation. These conduits also disintegrate and rot and are a constant expense.

J-M SECTIONAL CONDUIT will carry steam underground 1000 feet with practically no loss. Test recently made showed gauge pressure at boiler 100 pounds and the same at end of 600 foot run.

The same material which has stood up for more than 35 years without attention in Portland Sewer Pipe is used in J-M SECTIONAL CONDUIT. Acids, gases and the action of the earth do not affect it.

J-M SECTIONAL CONDUIT costs much less to install than others and costs nothing for maintenance.

Write nearest Branch for Catalog No. 103.

H. W. JOHNS-MANVILLE CO.

Baltimore	Dallas	Milwaukee	Pittsburg
Boston	Detroit	Minneapolis	San Francisco
Buffalo	Kansas City	New Orleans	Seattle
Chicago	London	New York	St. Louis
Cleveland	Los Angeles	Philadelphia	(1062)

THE TORRIDOOR HEATING SYSTEMS

Are Incomparably the Best for Health, Comfort and Economy
They Combine all Advantages of Other Systems
Are Simple, Efficient and Satisfactory

For Full Particulars Address

THE TORRIDOOR POWER, LIGHT AND HEATING CO. OF AMERICA : Home Office, EAST ORANGE, N. J.

Becker & Seidel, Cleveland, O., hot water heating Sandusky Soldiers' Home, for $10,590.

Springfield Plumbing Co., Springfield, Mo., central plant for Drury College, to cost $20,000.

Galveston Gas Fitting & Plumbing Co., Galveston, Texas, heating Rosenberg School in Galveston, for $4,253.

Downey & Kruse Co., Milwaukee, Wis., heating St. Bernard's Church, Milwaukee, for $4,273. Hawley down draft smokeless fire-box and boiler will be used.

Abner Werkhoff, Lafayette, Ind., heating and plumbing new high school at Eastport, Mich., for $3,000.

Martin & Wigman, Green Bay, Wis., remodeling heating plant in the Park School, So. Kaukauna, Wis. A fan blast furnace system will be installed.

Lewis & Kitchen, Chicago, heating new high school building at Oklahoma City, Okla., for $68,235.

Wallace Bros., Lafayette, Ind., enlargement of steam heating system for State Soldiers' Home, for $16,000.

Belden-Porter-Gray Co., Minneapolis, Minn., new heating plants for Prescott, Irving and Corcoran school buildings, aggregating $22,498.

W. A. Dunton, Norwalk, O., furnace heating St. Paul's R. C. Church, Norwalk, for $3,000.

Wheeler - Blaney Co., Kalamazoo, Mich., heating Central high school at Grand Rapids, for $28,500.

Central Laboratory Supply Co., Lafayette, Ind., heating and lighting plant for DePauw University at DePauw.

W. B. Van Sickle Co., Cleveland, O., heating annex to boys' school, for $7,625.

Charles M. Ewing, Nevada, Mo., remodeling steam heating State Hospital at Nevada, for $3,845.

Fred Herman, Council Bluffs, Ia., general contract for central heating and power plant for the Christian Home orphanage at Council Bluffs, to cost $14,000.

M. F. Rourke Co., Knoxville, Tenn., heating and plumbing new high school, Knoxville, for $12,578.

American Warming & Ventilating Co., Elmira, N. Y., furnace heating Porter Street school, Utica, for $3,385.

Gaylord & Butler, Scranton, Pa., city steam heating plant at Atlantic City. A pipe line 10,000 ft. in length will be connected with the new power house of the Atlantic City Electric Co. Contract price, $25,000.

John Bouchart & Son Co., Nashville, Tenn., steam heating new dormitory at Belmont College.

Fred Sprinkman Co., Milwaukee, Wis., pipe covering for $5,000,000 plant of Corn Products Mfg. Co., at Argo, Ill.

J. J. Hurley & Co., Boston, Mass., heating plant for Chelsea City Hall, for $23,065; also alteration in heating systems in Warren and Martin Schools, Boston, for $5,330.

Le Valley, McLeod & Co., Buffalo, N.

CENTRAL STATION AND INDUSTRIAL HEATING PLANTS
THE SCHOTT SYSTEMS

INDESTRUCTIBLE

UNDERGROUND CONDUIT AND INSULATION. GREATEST CAPACITY, EFFICIENCY AND HIGHEST CLASS OF CONSTRUCTION ARE THE DISTINCTIVE FEATURES THAT MAKE

THE SCHOTT SYSTEMS

THE BEST IN THE WORLD

W. H. SCHOTT, ENGINEER CHICAGO

"THE POTTER" MESH SEPARATOR

OR BOILER DRY-PIPE

DRY STEAM—SAFETY—ECONOMY

POTTER SEPARATOR CO., Newburgh, N.Y. N.Y. OFFICE: 39 Cortlandt St.

Y., heating new plant of the Automatic Transportation Co., at Buffalo.

Merrill Co., Boston, Mass., heating and ventilating Y. M. C. A. building in Boston, for $5,275.

Geo. H. McLean & Co., Springfield, Mass., heating Hampden County court house, for $17,460. The Wyckoff-Lloyd Co., Springfield, Mass., has the plumbing contract at $13,500.

Huey Bros. Co., Boston, Mass., alterations in heating system at Dwight School, Boston, for $3,817.

McLean & Comins, Boston, alterations in heating system at Dillaway school, for $3,687.

C. E. Thompson, Kansas City, Mo., heating and plumbing Knickerbocker apartments, Kansas City, for $47,000.

P. L. Bristol Plumbing & Heating Co., St. Joseph, Mo., remodeling heating system at the State Hospital, for $22,752.

Business Chances

Minneapolis, Minn.—Plans for a $160,000 heating and ventilating plant for the new State prison at Stillwater, Minn., have been drawn by Charles L. Pillsbury, engineer, Minneapolis, Minn. The institution comprises three large factory buildings, cell block building, hospital and administration buildings.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until Sept. 29, 1909, for the construction (including plumbing, gas fitting, heating apparatus, electric conduits and wiring) of the U. S. Post Office at Woonsocket, R. I.

Until Sept. 29, 1909, for the construction (including plumbing, gas piping, heating and ventilating apparatus, electric conduits and wiring, and standard clock system) of the U. S. Post Office and Court House at Great Falls, Mont.

Until October 6, 1909, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. Post Office at Lancaster, O.

Until October 7, 1909, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of an extension, remodeling, etc., to the U. S. Post Office at Jackson, Mich.

Wanted

A traveling salesman with A1 references wants the sole agency for Scandinavia for heating plants for residences and greenhouses. These to be carried in addition to his present line of steam and power plant supplies. Address Scandinavia, care of THE HEATING AND VENTILATING MAGAZINE.

An Opportunity to Make An Income on the Side

IF A GOOD PROPOSITION WILL INTEREST YOU WRITE AT ONCE TO

Manager Circulation Department
The Heating and Ventilating Magazine
1123 Broadway New York

A SPECIAL EDITON OF WILLIAM N. GROSVENOR'S

HUMIDITY CHART

(Published in THE HEATING AND VENTILATING MAGAZINE for May, 1909)

AND

LOSS OF HEAT FROM PIPES CHART

(Published in THE HEATING AND VENTILATING MAGAZINE for July, 1909)

Printed on strong paper, unfolded. PRICE, 25 cents, each, postpaid.
These charts are mailed in tubes and are suitable for framing.

Address, THE HEATING AND VENTILATING MAGAZINE, 1123 Broadway, N.Y.

NEW YORK HEATING

AND

VENTILATION SCHOOL

We not only TELL you how to design plants, but we SHOW you

RESULTS

FROM ANOTHER STUDENT

New York Heating and Ventilation School
1123 Broadway, New York

GENTLEMEN:—. . . . . Your course is certainly very instructive and valuable and I shall look forward with interest regarding your criticisms of my layout. . . . . .

Respectfully,

We will publish each month extracts from letters received from Consulting Engineers, Contractors and Draughtsmen in reference to what they think of our course.

We would be pleased to show originals.

Our booklet explains our method. Send for one. Address

New York Heating and Ventilation School

BOX 62, MADISON SQUARE

1123 BROADWAY **NEW YORK**

BOOKS ON HEATING AND VENTILATION AT REDUCED PRICES

Heating and Ventilating Buildings, a standard manual for heating engineers and architects. By Prof. R. C. Carpenter. Fourth edition, largely rewritten. 577 pages. 277 Ills., 8vo, cloth. $4.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $4.25.

Baldwin on Heating; or Steam Heating for Buildings. By William J. Baldwin. Fifteenth edition. Revised and enlarged. 391 pages. 131 figures. Size, 5x7½ in. Contains descriptions of steam heating apparatus for warming and ventilating large buildings and private houses, with remarks and tables. Cloth, $2.50, or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $3.25.

Questions and Answers on the Practice and Theory of Steam and Hot-Water Heating. By R. M. Starbuck. Illustrated. $1.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $1.75.

The Ventilation of the Schoolroom. By William J. Baldwin. Price, $1.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $1.75.

Ventilation of Buildings. By William G. Snow and Thomas Nolan. 83 pages. Pocket size. Contains a statement of the general principles of ventilation and of their application to different kinds of buildings. Boards, 50c.; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $1.25.

Steam Heating and Ventilation. By Wm. S. Monroe. Containing formulas and data valuable in the designing of heating and ventilating plants. Price, $2.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $2.60.

Air-Conditioning. By G. B. Wilson. Being a short treatise on the humidification, ventilation, cooling and the hygiene of textile factories—especially with relation to those in the U. S. A. With figures. 12mo. Illustrated. 143 pages. Price, $1.20; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $2.00.

Steam-Electric Power Plants. By Frank Koester. A practical treatise on the design of Central Light and Power Stations and their economical construction and operation. 473 pages. 340 ills. Price, $5.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $5.25.

Light, Heat and Power in Buildings. By Alton D. Adams, M. E. The purpose of this volume is to present in compact form the main facts on which selection of the sources of light, heat and power in buildings should be based. The problem is to determine the kind of equipment that will yield the service required at the least cost. 12mo. Cloth, $1.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $1.75.

Practical Steam and Hot Water Heating. By Alfred G. King. Containing over 300 detailed illustrations. The book is a working manual for heating contractors, journeymen steam fitters, architects and builders. Describes various systems of heating and ventilation and includes useful data and tables for estimating, installing and testing such systems. 8vo. 367 pages. Price, $3.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $3.25.

Power, Heating and Ventilation. By Charles L. Hubbard, B.S., M.E. A treatise for designing and constructing engineers and architects. The whole subject of heating is covered, including the heating of large institutions with central plants. Space is also devoted to electrical matters connected with steam plants. 647 pages. Price, $5.00 (three volumes in one); or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $5.25.

Notes on Heating and Ventilation. By John R Allen. 152 pages. 34 illustrations. Size, 4½x6½ in. One of the new books, brought quite up to date, and containing much information to guide the intelligent steam fitter in the installation and heating and ventilating apparatus. Cloth, $2.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $2.50.

Hot-Water Heating and Fitting. By W. J. Baldwin. Fourth edition. Price, $4.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $4.50.

Dean's System of Greenhouse Heating, by steam or hot water, with formulas for obtaining different temperatures, by Mark Dean. Price, $2.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $2.50.

Steam Fitters' Computation and Price Book, abridged. By Mark Dean. Price, $2.50; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $3.25.

Practical Treatise Upon Steam Heating. By F. Dye. Embracing methods and appliances for warming buildings, etc. Low pressure, high pressure and exhaust steam. 8vo, cloth, illustrated. Price, $4.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $4.50.

The School House. Its Heating and Ventilation. By J. A. Moore. 204 pages, illustrated. $2.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $2.60.

Ventilation in American Dwellings. By Dr. D. B. Reid. 12mo, 124 pages, 100 illustrations, cloth, $1.50; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $2.25.

A Manual of Heating and Ventilation, for engineers and architects, embracing tables and formulas for dimensions of pipes for steam and hot-water boilers, flues, etc. By F. Schumann. Second edition, revised and enlarged. 12mo, $1.50; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $2.00.

German Formulas and Tables for Heating and Ventilating Work, especially adapted for those who plan or erect heating apparatus. By Prof. J. H. Kinealy. Illustrated. Price, $1.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $1.75.

Tables for Calculating Sizes of Steam Pipes. By Isaac Chaimovitsch. A manual for the determination of steam pipe sizes for low pressure heating. 48 pages. 4 insert tables. Price, $2.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $2.50.

Centrifugal Fans. By J. H. Kinealy. A theoretical and practical treatise on fans for moving air in large quantities at comparatively low pressures. 206 pages. 39 diagrams. Full limp leather pocketbook, round corners, gilt edges. Price, $5.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $5,25.

The Principles of Heating. By William G. Snow. A practical and comprehensive treatise on Applied Theory in Heating. 161 pages. 42 illustrations. 38 tables. Size, 6x9 in. Cloth, $2.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $2.60.

An Outline of Warming and Ventilating By William J. Baldwin. Price, $1.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $1.75.

Modern Sanitary Plumbing, Steam and Hot Water. By James J. Lawler. 400 pages. 228 illustrations. Size, 6x9 in. This is the latest edition of Mr. Lawler's well-known work on this subject. Price, $5.00; or the book and one year's subscription to THE HEATING AND VENTILATING MAGAZINE, $5.25.

ADDRESS

The HEATING and VENTILATING MAGAZINE 1123 Broadway NEW YORK

Kinnear Pressed Radiators

have been in constant use for seven years without showing any signs whatever of deterioration, which proves conclusively that their durability is not only beyond question, but as great as any other standard form of radiator. They are superior to other radiators in absolutely every respect, as they require less space, with equal efficiency, weigh two-thirds less, economize in fuel, drayage, handling and installation; are absolutely sanitary and respond instantly to steam or hot water circulation. By your using them, you are not only increasing your profits, but are pleasing your clientele and architect by using an up-to-date instead of an ancient article.

¶ A post card will bring our new catalogue.

THE PRESSED RADIATOR COMPANY OF AMERICA

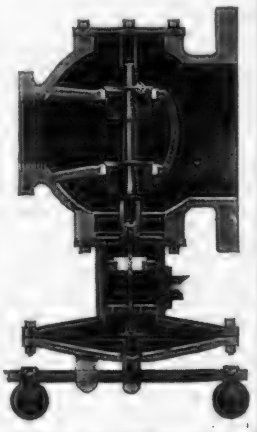
PITTSBURG, U. S. A.

Davis Pressure Regulators Save Steam

There is a Davis Pressure Regulator For Every Service

No matter what the pressure conditions are, or what the nature of the service may be, there is a Davis Pressure Regulator just suited for the work.

The piston type can be set to maintain any delivery pressure desired down to one pound, while the diaphragm type will reduce even lower if necessary.



Both valves are thoroughly mechanical in construction. They accomplish their purpose by the simplest and most direct means, which is the reason for their universally successful operation.

When you need a Pressure Regulator post yourself about the Davis. You may have a Catalog now if you will send for it.

G. M. DAVIS REGULATOR COMPANY

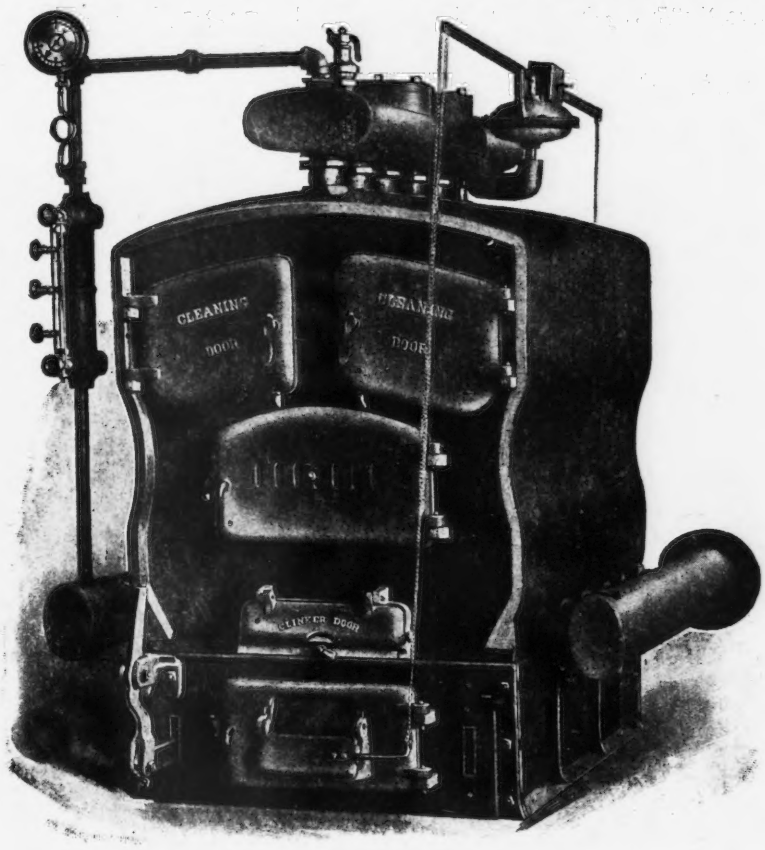
151 Milwaukee Avenue, Chicago

New York Philadelphia St. Louis
Boston Pittsburgh San Francisco

THE NEW "American"

Boiler For Steam and Hot Water

IS NOW READY FOR SHIPMENT



Showing the No. S 326 Boiler

Our Blue Book illustrates and describes this new boiler, shows interior construction, gives measurements, capacities and list prices. Ask for American Blue Book.

Pierce, Butler & Pierce Mfg. Co.

SYRACUSE, N. Y.

NEW YORK CITY	BOSTON	PHILADELPHIA
Cor. 4th Ave. and 22nd St.	61 High St.	936 Arch St.

The Heating Harvest

The advertising seed (explaining the merits of hot water, steam and vacuum heating) planted in publications of high standard and wide circulation is bringing a rich harvest to the Trade. Intensive cultivation with printed matter, booklets and personal letters to houseowners is producing a bumper crop of new business.

IDEAL Standard Water Boiler known among houseowners the country over.

Wise dealers are laying in full stocks of IDEAL Boilers and AMERICAN Radiators preparatory to garnering in the heating contracts from these broadly cultivated fields. Fall business promises to be better than ever.—Send in your orders.

AMERICAN RADIATORS & IDEAL BOILERS

AMERICAN RADIATOR COMPANY

General Offices: 282-284 Michigan Ave., Chicago

New York, Boston, Philadelphia, Chicago, Washington, Pittsburg, Cincinnati, Atlanta, Milwaukee, Buffalo, Indianapolis, Detroit, St. Louis, Omaha, Kansas City, Minneapolis, Denver, San Francisco, Cleveland, Seattle, London, Paris, Berlin, Milan